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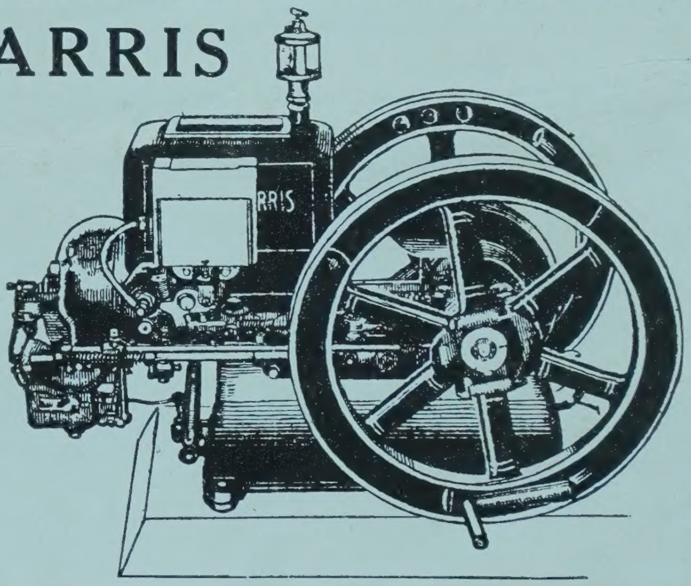

CONTENTS.

CONTENTS.

CONTENTS.

CONTENTS.

ANNUAL RATES OF SUBSCRIPTION.
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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXV. 1 JANUARY, 1926. PART 1.

Event and Comment.

The Current Issue.

A striking message to the farmers of the State from the Minister for Agriculture and Stock (Hon. W. Forgan Smith) is a notable feature of the current issue. Cotton breeding in Queensland is described in a valuable report by Mr. Wells. Mr. Ballard discusses the Pink Boll Worm and other matters of importance to cotton-growers. His notes were prepared at the instance of the Federal Department of Home and Territories, through whose courtesy we are able to reproduce them in the Journal. Mr. Hubert Jarvis contributes an interesting progress report on his Fruit Fly Investigations in the Stanthorpe district. The work of the Department in maize improvement is described by Mr. McKeon. This month Mr. Shelton discusses hairlessness, lack of vitality, and goitre in pigs; he has also a topical contribution on pig clubs. Mr. McGrath has a useful note on the campaign for better cows; and sugar crop prospects are reviewed by Mr. Easterby. A brief report of the initial business meeting of the newly constituted Manurial Experimentation Committee and an account of the Speech Day at the Gatton Agricultural High School and College, the occasion of the deliverance of some cogent addresses, add interest to a very readable number.

Opening of the Hamilton Cold Stores.

One of the notable events of the month was the opening of the State Cold Stores at Hamilton by His Excellency the Lieutenant-Governor (Hon. W. Lennon). In the course of introductory remarks as chairman, the Minister for Agriculture and Stock (Hon. W. Forgan Smith) paid a graceful tribute to Mr. Lennon, a predecessor in office, for his great work for the agricultural industry. Mr. Lennon's term as Minister, he said, had been marked by the planning and the laying of much of the foundation of the great advance in rural organisation that had taken place in recent years. As the

Bureau of Sugar Experiment Stations.

SUGAR CROP PROSPECTS.

The Director of Sugar Experiment Stations (Mr. H. T. Easterby) states that if the estimates of the several sugar-mills are realised this year Queensland shall have produced about 3,753,000 tons of cane—a record crop. It is expected that this amount of cane should yield 484,000 tons of raw sugar. In addition, the New South Wales production is estimated at 32,000 tons of sugar, and Victoria at 3,017 tons, making Australia's sugar output about 519,000 tons.

This immense output is the result of favourable seasons and a much larger acreage under cane. In the course of the past five years the area under cane has increased from 162,619 acres to 253,519 acres—an increase of over 90,000 acres. The number of canegrowers also has grown from 4,000 to upwards of 6,000 in the same period. In order that all of this large crop may be crushed, many of the northern mills will be obliged to continue operations well into 1926. Their capacity to do so depends entirely on the nature of the remainder of the season. Should a heavy wet season set in early, the mills which continue crushing after the New Year will be obliged to cease, and so leave much of the cane uncrushed.

Increase in Sugar Consumption.

The Government Statistician has given the consumption of raw sugar per capita as 138 lb. This on a 6,000,000 population basis would equal 369,000 tons of raw sugar. It is apparent therefore that the consumption has materially increased in recent years.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (7th December, 1925) from Mr. G. Bates, Assistant to the Entomologist at Meringa, near Cairns:—

Giant White Ants (*Mastotermes darwiniensis* Frogg).

This insect, one of the major cane pests, is well distributed over the Lower Burdekin, and was found in the following places:—Seaforth, Ana Branch, Jarvisfield, McDesme, Ayrdale, Pioneer, and Home Hill. Damage has also been reported from Inkerman, eight miles south of the latter place.

The termites prefer sandy soil, and at McDesme were found in abundance in a sandy ridge, yet cane close handy on heavier soil was untouched. Over twenty farms were found to harbour this pest, and in some cases the farmers were not doing anything to try and eradicate the ants. On the other hand several growers have been using a mixture of arsenic, caustic soda, and molasses, with splendid results. The correct proportions of this mixture are given in Mr. Cottrell-Dormer's report, "Queensland Agricultural Journal," July, 1925, page 9. It might be as well to repeat this formula, which is: Arsenic, 4 parts (by weight); caustic soda, 1 part (by weight, Q.D.A. formula).

These are mixed dry, and water gradually added until the whole is dissolved. For every 1 lb. of arsenic used, add two gallons of molasses. Three or four tablespoonsful of this mixture have been found sufficient to treat an average-sized fence post. Arsenic can be obtained free of cost from the Lower Burdekin Cane Pest Destruction Board.

During May, 1925, two experiments were laid out at Jarvisfield to determine the value of dehydrated tar and paradichlorobenzene, as deterrents against termites.

Dehydrated Tar Experiment.

Sets were dipped in dehydrated tar, drained, and planted with the cane planter in the usual manner. Results showed that dipping sets in pure dehydrated tar, regardless of how long they are drained, will seriously interfere with the germination of the plants. Termites did not attack the sets to any extent, although several of the untreated plants were eaten out.

Paradichlor. Experiment.

Two rows of cane, each 1 chain long, were treated with paradichlor. two days after planting. Doses of ¼ oz. were injected on both sides of the sets, 12 inches apart, 4½ inches deep, and 5 inches to the side of the plants. It was found that paradichlor. injected in this manner did not affect the germination of plants, as the treated plants "struck" as well as the rest, and no difference could be noticed in the growing plants. With regard to controlling white ants, this experiment gave negative results, as neither the treated nor control rows showed white ant damage. The previous season this block was badly damaged, but in the meantime the farmer had been poisoning the surrounding timber and fence posts with arsenic and molasses, and obtained heavy mortality.

From information gathered it seems that if poisoning is systematically carried out by every farmer, and timber cleared from the vicinity of canefields, the damage caused by white ants will be negligible. A large number of termites were collected and forwarded to Meringa for experimental purposes.

Grubs.

Grubs have not done such a great deal of damage this year, and as usual the damage is confined mainly to Ivanhoe. Growers in this locality should destroy the Black Palm, which is a feeding tree of the grey-back beetle (*Lepidoderma albohirtum* Waterh.). Beetles cannot be collected from these palms, and their destruction would force the beetles to trees from which they could be more easily collected. At Maidavale grubs were responsible for damage to young plant cane last June. A block of 1900 Seedling was planted towards the end of May, and grubs tunnelled into the sets, and later the roots and base of the young shoots were eaten, thereby killing the plants. Two acres as a result had to be replanted. The nature of the injury and general appearance of the grub points to this pest being a species of Dynastid.

Large Moth Borer (*Phragmatiphila truncata* Walk.).

By request of the Cane Pest Destruction Board, a visit was paid to several farms at Giru, where "borers" were reported to be doing a fair amount of damage.

This proved to be the large moth borer (*Phragmatiphila truncata* Walk.). Damage was most noticeable in H.Q. 426, but was also to be found in all other varieties. Farmers were advised to keep headlands clean, not to leave trash lying about, and to cut out and burn any affected shoots in young ratoons; also, if possible, to grow a harder variety than H.Q. 426.

This insect pest is to be found all over the Burdekin, more abundantly at Giru and Rita Island, and is frequently confused with the "weevil borer" (*Rhabdocnemis obscurus* Boisd.). The moth borer can be recognised as a caterpillar from 1 to 1½ inches in length; colour light purplish, indistinctly blotched with white; under surface white; head, light to dark red. The presence of moth borer in young ratoons can be noticed by the "dead hearts"—*i.e.*, the central leaves dying.

MINOR INSECT PESTS.

Bud Moth (*Opogona glycyphaga* Meyr.).

This insect, like the large moth borer, is to be found all over the Burdekin, but is of minor importance. It is, however, sometimes injurious to seed cane, as the caterpillars destroy the "eyes." Damage is more noticeable in the soft varieties, such as H.Q. 426.

Mealy Bugs (*Pseudococcus* sp.).

This insect is to be found all over the Burdekin district. It is of minor importance.

ACKNOWLEDGMENT.—The writer wishes to thank the members of the Lower Burdekin Pest Destruction Board for the invaluable assistance tendered him while in this district.

HINTS TO CANEGROWERS.

A. N. BURNS and R. W. MUNGOMERY, Acting Entomologists, Bureau of Sugar Experiment Stations, Gordonvale, North Queensland.

Grey-back cane beetles (*Lepidoderma albohirtum* Waterh.) are now emerging in considerable numbers, and may be seen every evening at dusk flying in their mating flight. After this flight, which lasts about an hour or so, they congregate on the foliage of their feeding trees, the principal of which are several species of figs (*Ficus* pilosa being the favourite one) and Moreton Bay ash (*Eucalyptus tessclaris*). Other trees are favoured, but the abovenamed will yield the most beetles. During

the day time large numbers of these insects can easily be collected from these feeding trees, as many as six or even more can sometimes be shaken from a single leaf, and in view of this many thousands of beetles may easily be destroyed by hand collecting. The advocation of collecting these notorious pests cannot be too highly emphasised, particularly where extensive areas are under cane, for when one considers that each fertile female is capable of producing from twenty-five to thirty grubs the next season—enough to eat out a stool of cane—the destruction of many thousands of these productive females must necessarily result in a considerable decrease of grubs in the ensuing season.

Regular cultivation should be carried out this month in order to have the cane free from weeds before the onset of the wet season, and the soil in good tilth so that fumigation against grubs may be carried out if necessary. A further advantage of having the soil in this condition is that it proves a hindrance to gravid female beetles about to enter the soil.

Growers whose farms are infested with the beetle borer (*Rhabdocnemis obscurus* Boisd.) should take every precaution to rid their farms of this pest. On the majority of fields burning of the trash is for the most part carried out, but in some places it is either ploughed in or allowed to remain on the surface to rot, and in this way to conserve the amount of organic matter in the soil. In badly infested fields, however, it is essential that the practice of burning the trash should be universally adopted. Not only is it sufficient to clean up the trash in this manner, but also old sticks of cane and sometimes bundles of cane that have been overlooked in the harvesting operations as well as the stout butts of cane tops, should be raked up into rows at regular distances and thoroughly burnt, thus getting rid of all possible breeding grounds which normally tide the borer over the period between harvesting and the time when the young ratoons begin to make cane.

Where a regular "pick up" is not carried out by the mill authorities, individual growers should from time to time, and especially at the end of the crushing season, gather up all cane that may have fallen from the trucks when passing through their fields, and have it destroyed, for otherwise in this manner pests such as the beetle borer may readily be transferred to clean areas and make the whole district a centre of infestation.

In centres where beetle borer infestation has become particularly heavy, a small block of cane about ¼ acre in area should be left to stand over for the introduction of Tachinid flies, and a communication be sent to the entomologist at Meringa. It is to be regretted that Tachinid flies in our breeding cages have suffered severely from an entomogenous fungus, and many have been killed, thus delaying liberations, but it is hoped that further liberations will shortly be made.

(*Continued on page 45.*)

Photo.: L. Vidler.]
PLATE 1.—THE PICTURESQUE BRISBANE RIVER, A GUM-SHADED BEND AT DUTTON PARK.

MAIZE IMPROVEMENT.

By C. J. McKEON, Assistant Instructor in Agriculture.*

Several maize plots, which had not reached maturity when the previous report was submitted, were harvested, and the following quantities of seed were selected:—

34½ bushels Golden Beauty, ex H. Ind, Beaudesert.
54½ bushels Golden Beauty, ex G. B. Mouatt, Kilcoy.
6½ bushels Golden Beauty, ex H. Schen, Kilcoy.
30 bushels Golden Beauty, ex W. Beverley, Boonah.
31½ bushels Funk's 90-day, ex J. Brent, Boonah.

A 3-acre plot sown with seed selected from Atherton maize was also gone over, but was found to be too uneven in type, and possessing too many other undesirable features to be worth further trial.

General.

Apart from the districts visited in connection with maize improvement work, to which the majority of the time was devoted, the following places were also visited:—Kilcoy and Gayndah to plant up, report on, and harvest dairy and pig fodder variety trials on G. B. Mouatt's and D. E. Greggery's farms respectively. Particulars of growth were secured, and small areas of each variety were harvested for arriving at the yield. Toowoomba was visited to witness a trial of the Eclipse maize harvester; Imbil and Kilcoy, to take particulars of and report on potato variety trials on A. H. Ernst's and J. Tinney's farms respectively; Gympie, to report on the quality of the land in response to an inquiry by W. Lang *re* fertilising pastures; and Atherton, in connection with the proposed maize improvement scheme.

Seed Maize Improvement.

Although the past season was an abnormal one in most maize-growing districts, the results on the whole have not come up to expectations, due to excessive rain, the heat-wave during February, and, in some districts, to early frosts. The mice plague was also responsible for a considerable amount of damage.

Many of the early sown plots suffered considerably from floods, and in some cases these were completely destroyed. Blight made its appearance in a number of plots during the cobbing stage, and reduced the yields greatly.

Owing to the sodden nature of the ground, plantings were rather late in some districts, particularly the Murgon district, through the farmers being unable to get the land prepared. In some cases the land was ploughed as many as four times, but rain fell immediately after each ploughing, and before the land was dry enough to work weeds had made such headway that another ploughing was necessary. The resultant crops were spoiled by the early frosts.

Mice were, more or less, bad in all districts, and one plot of Star Leaming at Boonah was completely eaten out. Arrangements were made for twenty-eight individual plots at Kilcoy, Boonah, Hivesville, Stanthorpe, Murgon, Imbil, Beaudesert, and Manyung. These totalled 161 acres, and comprised the following varieties:—Funk's 90-day, 24 acres; Reid's Yellow Dent, 22 acres; Star Leaming, 22 acres; Leaming, 13 acres; Funk's Yellow Dent, 32 acres; Golden Beauty, 7 acres; Red Hogan, 5 acres; and Improved Yellow Dent, 36 acres.

An "ear to row" test of each variety, with the exception of Red Hogan and Leaming (Ryan), was sown. Of the 161 acres arranged for, 10 acres were not sown, 2 acres were completely destroyed by flood waters when nearly ripe, 13 acres failed owing to tasselling during the heat wave, 3 acres were eaten out by mice, 11 acres were flooded and failed to germinate, 16 acres were cut by early frosts when the grain was in the milk stage, 10 acres were badly affected with blight and failed to develop ears, and 4 acres of an otherwise excellent crop were of no use for seed purposes, owing to the grower planting another variety at the same time, and both crops tasselled much at the same time. This makes a total of 69 acres, or over 40 per cent. of the total acreage arranged for.

The peach moth, which did so much damage last year, did little or no damage this season.

Funk's 90-Day.—Two plots of this variety, one at Hivesville and another at Kilcoy, did exceptionally well, but, unfortunately, only portion of the latter was harvested owing to flood waters covering the field to a depth of about 4 feet, on three different occasions just as the crop was ripening. The former crop gave

*Abridged from the Annual Report of the Under Secretary (Mr. E. Graham) to the Minister for Agriculture and Stock (Hon. W. Forgan Smith) for presentation to Parliament.

splendid results, and over 30 bags of seed were secured. The grower was asked to advise this office *re* the quantity of seed threshed, but this information has not come to hand to date. It is estimated that the crop would yield at the rate of about 70 bushels per acre.

The all-round improvement shown in this variety is highly satisfactory. Ripening is much more even, and the period of maturity is becoming shorter each season. The "ear to row" test plot and the surrounding propagation plot were sufficiently mature to harvest and store in the barn in 107 days from the date of germination.

The highest yield in the "ear to row" test plot was 57·14 bushels, and the lowest was 35·87 bushels, per acre. Considering the way this plot suffered from flood waters these yields can be considered very satisfactory. The type of grain, on the whole, was very good, and the colour fairly even; only a very small percentage of reddish-tinted grain being noticeable. The husk covering, although still weak, shows an improvement.

Funk's Yellow Dent.—Thirty-two acres of this variety were sown, but only one plot of 14 acres reached maturity, and this is only a light crop. Two other plots failed to germinate, and a 10-acre propagation plot and an "ear to row" test became badly affected with blight just after tasselling, and failed to develop ears of any size.

Reid's Yellow Dent.—None of the yields from the bulk plots come up to some of the previous season's yields. Three plots made great growth and promised to give heavy yields, but two of these were checked by blight, one very badly, and the third plot, which gave a very fine yield, had to be abandoned for seed purposes owing to another variety tasselling too close to be certain that cross-fertilisation had not taken place. The best yield was approximately 60 bushels per acre.

The highest yield from the "ear to row" test plot was 109·99 bushels per acre, and the lowest yield 45·18 bushels per acre. As usual the type of grain was very even. Husk covering was fair, and the height and direction of the ears was good.

Star Leaming.—Of the four plots sown two failed, but the remainder did very well, the type of grain and size of ears being particularly good. From one crop in the Mary Valley over 50 bushels per acre were threshed, and were it not for the fact that, at the very least, 30 per cent. of the crop was damaged by stock breaking in on several occasions, the yield would have been about 80 bushels per acre. Another plot at Beaudesert turned out very well, and, although a considerable number of plants were flattened and the ears ruined by a cyclone, yielded approximately 65 bushels per acre. The field characteristics were very good. Only seven rows of the "ear to row" test were harvested, the remainder being too badly damaged to be of any use for comparison purposes. The best yield was at the rate of 90·36 bushels and the lowest 69·09 bushels per acre.

Golden Beauty.—This has proved to be one of the hardiest of any of the varieties and does well in any district that it has been tried in. In the past the most undesirable feature was the height of the ears on the plant, but, as a result of continuous field selection, a gradual improvement has been noticed each year, and the majority of the ears are now borne about the middle of the stem. The type of grain is very even, and appears to be more fixed than any other variety, with the exception, perhaps, of Reid's Yellow Dent.

None of the bulk plots have been harvested to date, but the best of these will yield between 60 and 65 bushels per acre. The "ear to row" test was harvested, the highest yield being 69·09 bushels per acre, and the lowest yield 38·98 bushels.

Improved Yellow Dent.—Arrangements were made for sowing 36 acres of this variety, but one plot of 8 acres was not sown owing to continuous wet weather, and a 10-acre plot, planting of which was delayed by the same cause, was cut by frosts when the grain was in the milk stage. The remainder, including the "ear to row" test plot, has done well, but none have yet been harvested.

Red Hogan.—Only one plot was sown, and although it yielded fairly well the type of grain did not show any improvement. The ears are of good size, and the depth of grain is good, but the type is very uneven. This variety, or possibly the strain, appears to be very subject to mould, as this appears each season, and in any district, even though the season may be a very favourable one for drying maize.

Leaming.—Two plots totalling 13 acres were sown, but both gave very poor results. The weather conditions during tasselling were not the best, but were not sufficiently bad to be wholly responsible for the poor results.

Although the stalks were very light and short, the growth made up to the tasselling stage was very fair. The ears were very small and the grain rather shallow.

Ears were borne very low, many being no more than 2 feet from the ground. Sufficient seed was selected for further trials.

"Ear to Row" Test—Reid's Yellow Dent.

Row No.	Yield per Acre. Bushels.
402 x 141	67·77
402 x 142	78·40
402 x 143	100·99
402 x 144	59·79
402 x 145	45·18
402 x 146	55·81
Check	57·14
402 x 147	66·44
402 x 148	85·04
402 x 149	74·41
402 x 150	58·46
402 x 151	51·82
402 x 152	47·83

Sown 10-9-24; ripened 10-2-25; period of maturity 147 days.

"Ear to Row" Test—Golden Beaut

Row No.	Yield per Acre. Bushels.
410 x 121	45·18
410 x 122	61·12
410 x 123	58·46
410 x 124	61·12
410 x 125	46·50
410 x 126	39·86
410 x 127	38·98
410 x 128	53·15
Check	55·81
410 x 129	47·83
410 x 130	63·78
410 x 131	66·44
410 x 132	69·09
410 x 133	51·82
410 x 134	59·79
410 x 135	43·85
410 x 136	49·16

Sown 13-11-24; ripened 15-4-25; period of maturity 149 days (5 days allowed for germination).

"Ear to Row" Test—Star Leaming.

Row No.	Yield per Acre. Bushels.
403 x 126	71·75
403 x 127	71·75
403 x 128	82·38
403 x 129	90·36
Check	63·78
403 x 131	73·08
403 x 132	69·09
403 x 133	69·09
403 x 134	Too badly damaged by cyclone to take weights.
403 x 135	
403 x 136	
403 x 137	
403 x 138	
403 x 139	
403 x 140	

Sown 8-10-24; ripened 25-2-25; period of maturity 135 days (5 days allowed for germination).

"Ear to Row" Test—Funk's 90-Day.

Row No.	Yield per Acre. Bushels.
413 x 41	50·5
413 x 42	47·83
413 x 43	54·48
413 x 44	57·14
413 x 45	35·87
Check	40·52
413 x 46	42·52
413 x 47	41·19
413 x 48	Destroyed by flood.
413 x 49	
413 x 50	

Sown 14-10-24; ripened 3-2-25; period of maturity 107 days.

FRUIT FLY AND OTHER ORCHARD PESTS IN THE STANTHORPE DISTRICT.

By HUBERT JARVIS, Entomologist.

Mr. Hubert Jarvis, Entomologist, Stanthorpe District, has supplied the following progress report to the Chief Entomologist (Mr. R. Veitch, B.Sc., F.E.S.), covering the months of August, September, and October, 1925:—

FRUIT FLY.

Field Experiments.

The fruit fly cages erected over fruit trees in the orchard of Mr. J. W. Barlow, and referred to in my previous repots, have, during the months of August, September, and October, been periodically examined.

On 27th August these cages were visited in company with the Chief Entomologist, Mr. R. Veitch, and four fruit fly puparia were taken from under the fruit in one cage. When found they appeared to be healthy. Examination, however, proved three to be dead and one possibly alive.

On 7th October a portion of the soil in each of the above cages was put through a sieve, but not a single fruit fly puparium was discovered, nor were any empty pupa cases found.

No fruit flies have hatched in either of these field cages to date; this failure of any fruit flies to hatch in either of the above cages under almost normal natural conditions would seem to indicate that it is not the habit of the fruit fly (*C. tryoni*) to overwinter as a maggot or as a pupa in the "Granite Belt." Many hundreds of fruit fly maggots must have been present in each of these experimental cages. If the habit of the fruit fly is to overwinter as a pupa in the soil in this district, it is certainly remarkable that not a single fruit fly has so far emerged this season in these cages, notwithstanding the fact that the fruit fly is now again within the district.

On 30th October two fruit flies (*C. tryoni*) were trapped with "Harvey's lure" within the district; this is, to my knowledge, the first appearance of the fruit fly this season, about a fortnight later than last year.

On 15th October Dr. T. Bancroft, of Eidsvold, reported fruit fly hatching from citrus fruit at Eidsvold. He, moreover, forwarded me specimens of the fruit fly, and also fruit containing maggots.

Excursion to Taloom Scrub, New South Wales.

It was suggested at an Interstate Fruit Fly Conference held in Stanthorpe last June, and at which Mr. W. B. Gurney, Government Entomologist, New South Wales, and Mr. W. Allan, Fruit Expert, were present, that an excursion be made to the Taloom Scrub, situated in New South Wales (the entomologists of both Queensland and New South Wales co-operating), in order to search for any native host fruits of the Queensland fruit fly that might be growing in this scrub.

Accordingly, on 26th October, the visitors from New South Wales were met at Stanthorpe and driven by car to the Taloom Scrub.

Two days were spent in the scrub searching for native fruits, fruiting trees, and shrubs, and a fairly large number were collected and handed over to the botanist, Mr. R. Anderson, for identification. Mr. Anderson's report on same is not yet available. Fruit fly maggots were discovered in the berries of the Cheesewood tree (*Acronychia laevis*), and it is possible that these maggots will prove to be those of the Solanum fruit fly (*C. tryoni* var. *solani*).

Mr. W. B. Gurney, Government Entomologist, New South Wales, bred, in 1910, large quantities of fruit flies from Cheesewood berries. Some of these flies he has recently sent me, and examination proves them to be a fruit fly other than our Queensland fruit fly (*C. tryoni*). The specimens sent had been fourteen years in alcohol, and it is difficult to state with certainty whether they are the Solanum fly or a new species.

The Taloom Scrub occupies a belt about 3½ miles wide by 60 miles long, and it is, of course, impossible in two days to secure anything like a complete list of the fruiting trees and shrubs which may be growing in this area.

Again, at the time of the year that the investigation was made, there were comparatively few ripe fruits present in this scrub. This applies to most of our southern scrubs.

I am, however, of the opinion (after my brief acquaintance with the Taloom Scrub) that its potentialities in regard to fruit fly breeding and dissemination are very great. Traps were set in and on the border of the scrub and baited with "Harvey's lure," but no fruit flies were caught.

The Woolly Aphis Parasite (*Aphelinus mali* Hald.).

The first hatchings of this useful parasite recorded in the field this season were as follows:—Mr. B. Teale (The Summit) saw several Aphelinus active on his trees as early as 24th August. One of these he caught and submitted to me for identification. On 31st August Mr. A. H. Paget reported Aphelinus in numbers on his trees at work on the Woolly Aphis.

The first insectary hatchings recorded by Mr. S. M. Watson (assistant) were on 21st September, on which date eight insects emerged from the material placed in the breeding cage last autumn. From 21st September daily hatchings were recorded until the end of October.

The following is a list of the orchardists who have received the Woolly Aphis parasite this season, to end of October:—

Orchardist.	Locality.	Number Received.
F. Naylor	Applethorpe	30
J. Sewell	Applethorpe	30
E. O. Elwood	Applethorpe	15
H. J. Stanton	Eukey	30
R. Jolly	The Summit	25
J. M. Hannigan	Kyoomba	32
F. Beerling	Amiens	20
J. Board	Applethorpe	30
M. Jones	Kyoomba	60
A. S. Pringle	The Summit	30
J. Henderson	The Summit	30
—. Scott	Pozieres	25
J. Linneker	The Summit	40
J. Passmore	Stanthorpe	20
R. Ward	Broadwater	15
W. J. Long	Glen Niven	30
G. Sims	Applethorpe	30
J. Treymayne	Stanthorpe	30
R. Taggart	The Summit	30
A. Hall	Cannon Creek	30
T. Grant	Mount Tully	20
P. M. Kelly	Dalcouth	30
J. Murray-Prior	Reeves Gully	25
C. C. Sparrow	Pozieres	30
O. Phillips	Thulimbah	20
L. P. A.	Dalveen	100
G. Ramsay	Wyberba	20
Hall Brothers	The Summit	30
J. R. Taggart	The Summit	30
J. P. Halloran	The Summit	25
—. Lee	Broadwater	25
T. J. Thompson	Sugarloaf	20
C. Lister	Applethorpe	20
E. H. Little	Applethorpe	40
H. F. Stockton	Applethorpe	50
	Total	965

Woolly Aphis Parasite.

Two fairly large apple trees have been placed in the insectary and infested with Woolly Aphis. The Aphelinus is now at work on these trees, and it is hoped thus to have a continuous supply.

In regard to the usefulness or otherwise of this parasite in the orchards this season, it is, of course, too early to state an opinion. Reports from various sources are a little contradictory. In some orchards the parasite appears to have over-wintered and made a good start. In other orchards again, in which the Aphelinus was undoubtedly firmly established last season, it has failed to appear this season.

The Woolly Aphis is, of course, bound to get ahead of the parasite at first; this was noticeable last year. Later in the season, however, the parasite will usually catch up with and destroy the Aphis, cleaning the trees before the fruit is ripe.

Should the Woolly Aphis remain two or three months on the tree before being destroyed by the parasite, the usefulness of the latter is questionable, as the Woolly Aphis can, if unchecked, do a great deal of harm to an apple tree in three months; in fact, it is claimed that Woolly Aphis can entirely kill an apple tree if left unchecked for twelve months.

The female Aphelinus has been kept alive under laboratory conditions for twenty-one days; the artificial food used was honey and water.

I am indebted to the members of our local inspectorial staff for aiding also in the work of distributing the parasite.

Last July application was made by Mr. F. Wort, of Raby Bay, Cleveland, for a consignment of the Woolly Aphis parasite.

Mr. Wort was desirous of giving the parasite an opportunity to attack the Black Citrus Aphis, so injurious to the young foliage of his orange trees. A supply of the parasite was accordingly sent to him in July last, and an additional supply later. Mr. Wort, who was successful in rearing a good number of Aphelinus from the material sent him, writes as follows:—"The first insects emerged on 4th August, and to date, 7th September, I have released upwards of fifty."

This is the only attempt, to my knowledge, yet made in Queensland to introduce *Aphelinus mali* to the dark-coloured Citrus Aphis, which, according to New Zealand reports, it will attack, and I am much indebted to Mr. Wort for the trouble he has taken in the matter, and trust that he may obtain satisfactory results.

Several efforts were made this season to induce the Woolly Aphis parasite to attack the Black Peach Aphis (*Myzus* sp.), which is such a destructive pest in the Stanthorpe district. I have as yet, however, no record of *A. mali* attacking Peach Aphis.

Paradichlorobenzene Experiments.

Further experiments with this soil fumigant have been made at Ballandean and The Summit, with the object of controlling the Woolly Aphis of the apple (*Eriosoma lanigera* Hausm.) on the roots of the apple trees, and also the Black Aphis of the peach.

In regard to the latter aphis, our experiments have proved a little disappointing, but although we cannot claim a control of the Peach Aphis, yet results seem to indicate that treatment of the roots of the trees subject to aphis attack with paradichlorobenzene is partially effective, and I consider that further experiments should be made next year at earlier dates.

OTHER INJURIOUS INSECTS.

Codling Moth *(Cydia pommonella)*.

The first insectary hatchings of the Codling Moth were on 7th October. In the departmental field cages, however, hatchings were earlier, viz., 18th September.

Apple Weevil *(Orthorhinus cylindrirostris)*.

Inspector St. J. Pratt submitted specimens of this insect from the Broadwater district causing damage to apple shoots and small branches.

I have already recorded this beetle from Dalveen similarly associated with the apple (vide Report, September-October, 1924), and I have also found the larva of this beetle (commonly known as Elephant Beetle) boring in grape vine wood, and the adult insect was bred out in the insectary.

Since the above record I have found this beetle breeding abundantly in native "Stringy Bark" timber.

I do not think that it is likely to become a pest in relation either to the apple or the vine, and the ordinary arsenate of lead spray should prove effective in controlling it.

Apple Case Moth.

A case moth larva (*in situ*) was on 27th August brought to this office by Inspector St. J. Pratt; this case moth, which was associated with the apple, is of a species unknown to me, and it is hoped to breed out the adult moth for identification.

Greedy Scale *Aspidiotus* (Hemiberlesia) *Camelliae* Sig.

I am indebted to Mr. H. M. Jones, of Broadwater, for submitting specimens of pear wood infested with a scale insect very similar in appearance to the San Jose Scale. Specimens were forwarded to Mr. H. Tryon, Government Entomologist and Pathologist, who identified the scale insect, and who reports as follows:—

> The scale insects, infesting the wood of the pear, are of much interest, not as being an uncommon kind of Coccid, but as being associated with the tree on which it has been met with, for, notwithstanding it has a very large and varied number of host-plants, I cannot recall having myself seen it upon the pear, nor of anyone else having reported its occurrence in this association.
>
> It is named *Aspidiotus* (Hemiberlesia) *Camelliae*, Signoret, but is also known as *Aspidiotus rapax*, Comstock, the term *rapax* having reference to its rapacious appetite, so to speak, or rather the extensive range amongst plants figuring in its dietary, a feature commemorated in the popular designation ''Greedy Scale,'' that was often formerly bestowed upon it.
>
> It is one of those scale insects that might be readily mistaken for the Pernicious or San Jose Scale (A.perniciosus), but the adult insect is rather larger and has a much more swollen ''cover,'' the general colour of which is more in harmony with that of the bark than happens in the case of this more notorious pest.
>
> The Greedy Scale yields to the same treatment as does the Pernicious or San Jose one, but may be more readily destroyed. However, it is a less harmful pest since it does not instil a poison into its victim whilst feeding.

Fungus Diseases.

During the months covered by this report many fungus diseases of the apple, pear, and peach have been submitted to this office by various members of the inspectorial staff, and forwarded to the Government Entomologist and Pathologist, Mr. H. Tryon, whose reports on the same have been duly received.

Concluding Remarks.

From 31st August to 23rd September I was away on leave of absence. During this period Mr. S. Watson was in full charge of laboratory and field experiments, and ably met every demand on his services.

THE KILLING OF GREEN TREES WITH ARSENICAL POISON.

In response to several inquiries on the subject, this note is reprinted from a previous issue. Trees, of course, should not be killed indiscriminately.

The trees to be killed with arsenical poison are first rung or ''frilled'' by making downward cuts with the axe completely round the tree, each cut well overlapping the adjoining one, so as to leave absolutely no unsevered section of bark in which the sap could flow. The cuts must be made right through the bark into the wood proper, and as close to the ground as possible, say from 6 to 12 inches up. The poison, prepared as given below, is poured into this frilling right round the tree, using an old teapot or kettle, as the spout makes pouring easier and prevents wastage of solution. A large tree of 4 feet diameter may require about one quart of the solution, smaller trees proportionately less. Small saplings and suckers may be cut off level with the ground and thoroughly swabbed with the poison.

Trees may be killed by ringbarking or by frilling combined with poisoning at any time, but unless a suitable season is chosen suckering is likely to take place. From May to July is probably the best period of the year to carry out the work successfully. In the winter months the sap is assumed to be down, and therefore the end of autumn and during the winter the trees and undergrowth are more easily killed.

Preparing the Poison.

The arsenic may be dissolved with the aid of caustic soda or washing soda; when using the latter boiling from half an hour to one hour is necessary before all the arsenic is dissolved.

Under ordinary circumstances 1 lb. of arsenic and 3 lb. of washing soda or 2 lb. caustic soda to 4 gallons of water is of sufficient strength to kill timber, but when it is a question of making doubly sure and kill more quickly in the case of vigorous saplings the solution can be used double strength.

The preparation and mixing is best done in an empty kerosene tin, which holds 4 gallons. When using caustic soda mix 1 lb. of arsenic and 2 lb. caustic soda thoroughly in the dry state, and add gradually and carefully water.

Sufficient heat is generated to dissolve the whole of the arsenic. Make up to 4 gallons, and finally stir in ½ lb. whiting, which latter indicates readily which trees have been treated. If washing soda is to be used mix 1 lb. of arsenic and 3 lb. of washing soda into a paste with some water, add about 2 gallons of water, and boil for half to one hour until all arsenic is dissolved. Make up to 4 gallons and add the whiting.

There is not much danger to stock grazing on areas treated by poison, and the leaves fallen from the poisoned trees would not contain any poison, but it is safer to keep the stock off such areas for some weeks, as they might lick some of the poison from the frills on account of the salty taste.

MILK AND PUBLIC HEALTH.

By L. VERNEY, Dairy Inspector.

The value of milk as a food has never been fully appreciated, and the tendency appears to be towards its curtailed consumption in its natural form. This is explained when we consider the convenience of the many preparations offered consumers as substitutes for liquid milk, but it is hardly conceivable that in the case of the requirements of invalids and infants preference would be given to the prepared forms. The superiority of cream fresh milk is incontestable, and dairy farmers and those engaged in the milk business should be able to count upon the support of all municipal authorities and other organisations actively interested in the welfare of invalids and children. The several herd book societies concerned in the breeding of high-class dairy animals could with advantage co-operate in any scheme for increasing the demand for new milk. We live in an age of propaganda, and not even milk, the irreplaceable produce of the cow, can escape the risk of neglect if nothing is done to proclaim its virtues to an indiscriminating public.

Much has been said of late on the matter of milk distribution, and present methods could certainly be improved upon. Hygienic practice is to supply milk in sealed bottles or glass jars. This method also has its drawbacks unless distributed from a central depôt under the control of the authorities where strict supervision is exercised. Milk that conforms to a high standard only should be allowed to go into consumption. Even bottled milk sold by dairymen may not always be pure or wholesome. The mere fact that milk is delivered in bottles where no supervision is exercised means little or nothing in respect to freedom from harmful contamination; it only implies that contact with external impurities cease with the sealing of the bottle. This, of course, is an appreciable consideration, but it does not discount or correct imperfections already present before the milk is bottled, and in this way the mere fact of milk being purveyed in bottles may only tend to allay suspicion and not prove an absolute safeguard against impurity and inferior quality. These imperfections would be eliminated when the milk is treated and bottled by a central authority and the consumer assured of a pure commodity free from dust, germs, or any other deleterious matter. In order to avoid the risk of disease, it is necessary that milk should be pasteurised before going into consumption. It is common knowledge that disease and contagion may be transmitted through milk, consequently great care should be taken in every department from the time of milking until it is consumed. Milk will one day be sold according to its grade and quality, a system that should appeal to all classes of people, especially to those with little children.

It is most important that those responsible for the production of milk should remember that two things are most necessary in order that a pure supply may be forthcoming, viz.—

1. To prevent the absorption of foul odours.
2. To prevent the development in the milk of living organisms that are liable to cause taint.

The first can be accomplished by not feeding the cow with taint-inducing feeds, and by keeping the milk in a pure atmosphere. The second result can be obtained by "cleanliness." Dirt and filth are so intimately connected with bacteria in nature that germ life can be largely excluded by keeping out dirt. This cannot be emphasised too strongly.

THE CAMPAIGN FOR BETTER COWS.

HERD TESTING—GOVERNMENT ENCOURAGEMENT.

C. McGRATH, Supervisor of Dairying.

The Department of Agriculture appreciates the interest taken by Local Producers' Associations in dairying centres in the matter of herd testing, as evidenced by the receipt of upwards of 100 applications through Local Producers' Associations for the services of departmental herd testers for 1925-1926 herd testing season.

The scheme inaugurated by the Department of Agriculture and Stock for a production test of all dairy cows is free of cost to the owners. Every encouragement is given, and facilities are placed in the way of all dairy farmers to enable them to avail themselves of the services of official herd testers, and all dairy farmers are advised to co-operate with the department by embracing the opportunity offered.

It is realised that the unfavourable weather conditions that prevailed during September and October last have delayed other centres from joining the campaign for better cows.

A Sure Foundation for Success in Dairying.

Systematic testing of dairy herds is the chief factor in securing efficient service from each cow—fed, milked, and cared for. A herd of profitable dairy cows properly cared for is the sure foundation on which a successful dairy business can be built.

All primary producers interested in the dairy industry should become interested in ascertaining what their cows are doing. They will become more interested when they co-operate with the official herd testers, and keep records of the production of each cow.

Before the testing season is over some cows will be found to disappoint, while other animals will surprise by the way they hold out in production and by test.

Progressive dairy farmers believe it pays to test their cows and submit their herds to a production test.

Every dairy farmer should know the cows that are making a profit and those that are being kept at a loss. Such information can be obtained by taking advantage of the herd testing scheme inaugurated by this department.

The day has arrived when mere guess work by dairy farmers must be superseded by the adoption of the business method of herd testing, the objective being to keep fewer but better cows, to reduce expense, and increase income. Cow testing associations should, therefore, receive every encouragement, and much good can be accomplished by such activities.

The Negative Side.

There are things that herd testing organisations cannot do. They cannot compel a dairyman to destroy or sell to the butcher the inferior cows in his herd if he desires to keep them. They cannot compel him to buy a better bull and to select and rear heifer calves from high producers only. They cannot make him provide and store feed and feed according to production.

The work and results of herd testing associations will, however, point the way, and urge the dairy farmer to direct his attention to the economical importance of his dairy herd, and of his dairy farm, and of the value of his own time, and assist in ensuring prosperity in his business.

The better bull campaign, the method of disposal of the unprofitable dairy cows, and the conservation of fodder on the dairy farms should receive the attention of local producers' associations in dairy centres with a view to the formulation of an organised and comprehensive and practical scheme for making more effective the work of the herd testing officers.

Things Already Done—Dairymen Working in the Dark.

The following extracts from the annual report of the herd testers, covering the 1924-1925 period, will be of interest to dairy farmers.

It is a summary of the work done, and provides evidence of the fact that a great number of dairymen are working in the dark.

A perusal of the figures quoted should stimulate a desire in every dairy farmer to seek the enlightenment afforded by a system of recording individual yields of animals comprising their dairy herds. Such knowledge makes for progress and ultimate success:—

The number of herds submitted under the department's herd testing scheme was 994, comprising 21,918 cows, an increase of 76·5 per cent. over previous records.

The average daily yield of milk per head of all cows tested was 16·79 lb.

The average daily yield of milk per head of the highest producing herd tested was 46.1 lb.

The average daily yield of milk per head of the lowest producing herd tested was 6.5 lb.

One individual cow produced 65·25 lb. of milk in twenty-four hours. This is the highest individual yield recorded under ordinary herd testing conditions.

The average daily production of butter fat per head of all cows tested was ·68 lb.

The highest individual daily yield of butter fat was 2·28 lb., and the lowest ·13 lb.

The number of herds submitted to tests in the Darling Downs area was 334, comprising 7,340 cows. This was the largest number tested in this district to date. The results bear a favourable comparison with those of other dairying districts visited by the herd testers. The average yield of milk and butter fat per cow is well above the average of all herds tested, while the highest producing individual herd, also the highest producing individual cow, were within the Darling Downs area.

In the North Coast area 264 herds, comprising 5,680 cows, were submitted to test. Some individual herds well above the average production are located in this area.

In the Kingaroy district 149 herds, comprising 3,226 cows, were tested. Some excellent dairy herds, the property of progressive dairymen, were submitted for testing, which accounts for an average production next to that of the Darling Downs.

In West Moreton the operations of the herd testers were confined to a limited area within this important dairying district, in which 133 herds, comprising 3,426 cows, were tested. Some good dairy herds are located in this area.

On the Gayndah line weather conditions checked testing activities, which diminished after a heat wave. The work ceased early in April. Eighty-three herds, comprising 1,651 cows, were partly tested.

Testing in the Mount Perry district was confined chiefly to Gin Gin and Tirroan, where thirty-one herds, comprising 595 cows, were tested.

Production below the Payable Line.

A comparison of the average production of the highest yielding herd with that of the lowest producing herd tested, and by comparing the highest individual yield with the lowest individual yield, provides convincing evidence that there are many herds of dairy cows with an average production well below the payable line, and that there are individual cows in many dairy herds that do not pay for the labour of milking.

SUMMARY OF YEAR'S OPERATIONS.*

Number of herds tested	994
Number of cows tested	21,918
Daily yield of milk in tested herds—	lb.
Mean	16·79
Highest	46·1
Lowest	6·5
Butter fat content of herd milk—	Per cent.
Mean	4·08
Highest	6·25
Lowest (once-a-day milking)	2·3
Daily amount of butter fat produced in herd—	
Mean	·68
Highest	1·60
Lowest	·29
Amount of milk yielded by individual cow daily—	lb.
Highest	65·25
Lowest	2·0
Amount of butter fat yielded by individual cow daily—	
Highest	2·28
Lowest	·13
Butter fat content recorded—	Per cent.
Highest	10·6
Lowest (once-a-day milking)	1·2

*From Annual Report, 1924-25, Department Agriculture and Stock, Queensland.

HAIRLESSNESS, LACK OF VITALITY, AND GOITRE IN PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

A number of instances have come under notice in which farmers have suffered severe losses from absolute lack of vitality in certain litters of pigs, and in some of these cases the suckers were the progeny of sows kept under exactly the same conditions. In other instances it appeared to be only the progeny of certain sows that have exhibited these indications of bodily weakness. In some cases the pigs thrive admirably for the first three, four, or even the first six or seven weeks; they then begin to fade away, dropping off one by one until the bulk, if not all, have died. There does not appear to be any specific disease present in these cases, though in one or two instances it was evident that the sow had suffered from an inflammation of the udders and had possibly developed the trouble commonly referred to as milk fever, and had not regained her normal milk supply, but in most instances both the sow and her progeny appeared normal up to the stage referred to.

The writer is convinced that these are cases in which the lack of vitality indicated a serious lack of nutriment in the food, possibly a lack of vitamines, those strength-giving units in our food about which we have heard so much in recent years. Prior to coming to Queensland several cases of hairlessness in newly-born pigs were investigated, this latter trouble apparently being associated with the development of goitre, a peculiar disease about which we know all too little. Professor John M. Evvard, one of the most prominent of American authorities on hog raising, has recently been devoting a good deal of time to a study of that trouble. Answering a correspondent recently he referred to the trouble in this way:—

Iodine such as is contained in the potassium iodide and sodium iodide, recommended as additions to mineral mixtures for pigs, is of immense importance in promoting the right kind of uter or prenatal development. If there is not enough iodine in the ration, then the absence of this material will show itself in the resulting pig crop. In this connection we are wondering if you have ever noticed any hairless pigs in your herd? Hairlessness in the new-born pigs is, in a great many cases, due to an insufficient amount of iodine in the ration. Potassium iodide carries approximately 76·45 per cent. of iodine, and sodium iodide carries in round numbers 84·66 per cent. of iodine.

In three different experiments carried on at Ames, Iowa, U.S.A., wherein the only difference between the rations compared was a small amount of potassium iodide fed, we secured an average of 10 per cent. greater gains with a 10 per cent. lesser feed requirement where the iodine was added to the ration of young growing and fattening pigs. There is less chance for iodine deficiency in the sows kept out on pasture in the summer time. Lack of iodine in the ration caused the pigs to be carried overtime, hence the sows were late in farrowing. The question of exercise is one of importance also with sows having difficulty at farrowing time and in cases where the birth of the pigs is unduly delayed, inasmuch as pampered sows, those which are not permitted to exercise properly, are more likely to be slow in giving birth to their young than those pregnant sows which are allowed to have wider range. Professor Evvard has also recently contributed to the "Chester White Journal" a further report of the experiments conducted at Ames, and as this is of immense importance to pig-raisers here we take the liberty of reproducing these articles in full. The first of this series of articles was reprinted in the November Journal and will be found on page 448 of that issue. On the following pages is a reprint of the second of the series.

PROFITABLY FEEDING IODINE TO SWINE—II.

BY JOHN M. EVVARD.*

It is the purpose of this article to present some evidence that in one locality of this widespread goitrous area of the United States—namely, Ames, Iowa—the addition of iodine to the ration of young growing swine is good practice—this in spite of the fact that in the fifteen years of the senior author's experimental experience at the Iowa Station no recognisable goitre symptoms developed in any of the swine of the station, nor did any hairless "full-time" new-born pigs appear. When there is an iodine deficiency the young are usually carried over time by the pregnant sows.

* A prominent American authority on pig breeding and feeding and a well-known contributor to the "Chester White Journal." The first article of this series was reprinted in the November (1925) "Queensland Agricultural Journal."

In these fifteen years, 1910-1925, the station never had less than 300 new-born pigs in the spring, and oftentimes the number ran up to approximately 800; in the fall the number of pigs farrowed ran from 150 to over 300. With such large numbers of pigs under observation it would appear that if there were a shortage of iodine sufficient to produce a goitrous condition in our swine we would have had the hairlessness and other correlated conditions exhibited.

Ewes, on the other hand, drinking of the same water as the swine and partaking of feeds from the same fields, in four years of sixteen presented some lambs with goitre. In the other twelve years we saw no evidence whatsoever of gross goitrous pathology. The ewes themselves did not exhibit goitres sufficiently large to be noticeable on palpation, but the lambs which had goitre surely had noticeable ones.

Inasmuch as goitre represents fairly advanced stages of the iodine deficiency disease, it is easy to see that there may be a shortage of iodine in the ration sufficient to prevent adequate nutrition and yet not be so great a deficiency as to develop goitrous pathology. Inasmuch as the presence of goitre was noted in our sheep flock and not in our swine herd, it would appear that perhaps sheep had a greater quantitative need for iodine than swine in order to prevent the appearance of goitre. If it is true that feeds of low fat content tend to conserve the iodine supply, and that leafy vegetables or roughages as well as the coarser milled products of seeds carry more iodine than concentrated feeds, then one might logically assume that the breeding flock, under Ames conditions, actually secured a larger supply of iodine suitable for their nutrition, proportionately, in their feeds than did swine. The actual quantitative requirements of sheep and swine for iodine remain for future determination.

In the summer of 1920 we fed in Experiment 208 two lots which are of much interest. These lots had five pigs each and the feeding lasted from 29th July until the pigs reached an average weight of 225 lb. When the experiment started these pigs ranged from two and a-half to three months in age, and weighed on the average practically 50 lb. per head

The allotment and rations fed were as follows:—

Lot A.—Grazed on rape pasture. No iodide, a check lot. Shelled corn grain, mixed colour, yellow and white, self-fed; plus supplemental protein, vitamin, and mineral feed mixture (meat meal tankage, 20; corn gluten meal, 15; corn oil cake meal, 20; linseed oil meal, 10; prime cottonseed meal, 20; bone meal, 3; and flake salt, 2 lb.; total, 100 lb.) self-fed; plus pressed block salt of unusually good grade, self-fed.

Lot B.—Grazed on rape pasture (iodide fed). Fed exactly like Lot A with the exception that one-tenth (0.1) pound of potassium iodide was thoroughly mixed with one thousand (1,000) pounds of the supplemental protein, vitamin, and mineral feed mixture.

Lot A took 145 days to reach 225 lb. average weight, whereas Lot B getting iodide took only 133 days. Lot A took 440 lb. of feed and Lot B only 385, or 55 lb. less, for the 100 lb. of gain made.

It is plainly evident that the iodide fed Lot B outgained Lot A, which received no added iodide. It is also evident that the feed requirement was considerably lessened by iodide feeding.

The potassium iodide intake per pig for the 133 days of feeding averaged two thirds of a grain daily, this being equivalent to only half of a grain of iodine added.

Lot A, which took 440 lb. of feed for the 100 lb. of gain, as contrasted with 385 lb. in Lot B, iodide fed, showed a loss of feed, or an added feed requirement, of 55 lb., due to the lack of iodide feeding. On a percentage basis this amounts to better than 14 per cent. more feed being required for the unit of gain where the iodide was omitted from the ration.

Summarising, it appears that the young growing swine fed in this Experiment 208 on rape pasture showed beneficial results from iodide feeding. The average daily gain was greater by 8.4 per cent. because of the iodide addition, and the feed requirement was lessened by 12.5 per cent. Commercially, such results as these, when capitalised in practice, are of much significance. But let us proceed to another experiment.

In the summer of 1921 we fed in Experiment 220 three lots of seven pigs each from 4th August until the pigs reached an approximate average weight of 225 lb. When the experiment started these pigs were approximately three months old and weighed on the average practically 50 lb. per head.

The allotment and rations fed were as follows:—

Lot A.—Dry lot (no iodide check). Shelled corn grain, mixed colour, yellow and white, self-fed; plus supplemental protein feed mixture (prime cottonseed meal, 80, and Armour's dried blood meal, 20 lb.; total, 100 lb.), self-fed. Then pounds of mineral mixture A were mixed with each 100 lb. of the supplemental protein feed mixture. Mineral Mixture A consisted of high calcium limestone, finely ground, 33.33; flake salt, 33.33; and bone meal, 33.33 lb.; total, 100 lb.

Lot B.—Dry lot (iodide fed). Same as Lot A with the exception that potassium iodide was introduced into the mineral mixture, giving this new Mineral Mixture B the following composition:—High calcium limestone, finely ground, 33.3; flake salt, 33.3; bone meal, 33.3; and potassium iodide, 1 lb.; total, 100 lb.

The addition of potassium iodide to the ration as fed to these young swine resulted in a greater average daily gain and a lessened feed requirement.

The lots reach 225 lb. weight as follows:—A 112, and B 102.5 days, a saving of 8.5 days due to iodide feeding.

The appetite for feed did not seem to be altered much in this experiment by iodide feeding, although, as in the first experiment the iodide-fed pigs consumed a little less.

The potassium iodide intake per pig averaged for the 110 days of feeding .85 grain daily, this being equivalent to 0.51 grain of iodine added. It will be remembered that in the first experiment the iodide-fed lot consumed two-thirds grain daily, equivalent of a half grain of iodine; under the circumstances of the experiment it appears that this is rather a close agreement from the quantitative ingestion viewpoint.

Lot A was clearly excelled by Lot B, receiving iodine, the feed required for 100 lb. of gain being, respectively, 425 and 385 lb. Here is an added feed requirement of 40 lb. due to the lack of iodide feeding. On a percentage basis this amounts to better than 10 per cent. more feed being required for the unit of gain where the extra iodide was omitted from the ration.

Summarising, it appears that the young growing swine fed in this, the second iodide feeding Experiment 220, in dry lot, showed beneficial results from iodide feeding. The average daily gain was 8.3 per cent. greater when potassium iodide was fed, and the feed required for a unit gain was lessened by 9.4 per cent. The iodide-fed pigs likewise showed greater dimensional growth. The results of this second experiment are in practical accord with the results of the first.

Photo.: C. E. F. Allen.]

PLATE 2.—A PEANUT GRADER, USED BY KINGAROY PEANUT POOL BOARD.

The Grader is an ingenious and efficient machine, invented by the Foreman of the Grading Shed at Kingaroy, Mr. Cavanagh, who is in the picture standing alongside his useful invention.

ABSTRACTS AND REVIEWS.

All foreign agricultural intelligence in this Section, unless otherwise stated, is taken from the International Review of the Science and Practice of Agriculture, published at Rome by the International Institute of Agriculture.

Manurial Value of Sugar-cane By-products.

DYMOND, G. C., "Sugar," Vol. xxviii., No. 3, pp. 134-135. New York, 1925.

Sugar-cane requires about nine primary chemical substances as plant food material, and the deficiency of any one of these, and not the superabundance of the others, determines the crop yield, hence the importance of returning to the soil residues containing chemical bodies removed by the crop.

Samples of cane trash and tops were taken from a 15 months old plant cane; the stalks showed an average sucrose content of 12.4 per cent.

Analyses of the dry substances were made, the ash giving the following results:—

Tricalcic phosphate—In trash, a trace; in tops, 6 per cent., or 17 lb. per acre.

Potash—In trash, 3.2 per cent., or 15 lb. per acre; in tops, 23 per cent., or 77 lb.

Magnesium oxide—In trash, 1.8 per cent. and 6.17 per cent. in tops.

Chlorine—0.5 per cent. in trash and 9.4 per cent. in tops.

The value of the dry trash is about 4s. 3d. per ton, or 12s. per acre, and that of the dry tops 19s. 9d. per ton, or 38s. per acre.

On a crop of 100,000 tons of cane the value of the dry tops would be £6,170 and that of the trash £1,550.

Analyses of the bagasse ash showed—Silica, 66.5 per cent.; tricalcic phosphate, 3.2 per cent.; potash, 4.4 per cent.; sulphates, 12.63 per cent.; the total value of the potash and phosphate being 19s. 7d. per ton.

Dry filter press cake contained—Nitrogen, 1.06 per cent.; phosphate, 3.13 per cent.; potash, nil; the value works out at 18s. 7d. per ton. This cake is very suitable for light soils when applied at the rate of 6 to 8 tons per acre.

The manurial value of molasses works out at 9s. 10d. per ton, or £1,536 per 100,000 tons of cane, of which £1,276 is due to the potash content. The most scientific method of dealing with this product is first to obtain the sugar value in alcohol, and then to utilise the residue as manure.

Sugar-cane should not be an exhaustive crop if, as is possible in practice, a large proportion of the chemical substances removed by the crop is returned to the soil.

Orchard Practices in the Citrus Industry of Southern California.

VAILE, R. S. University of California, Agricultural Experiment Station Bulletin, No. 374, pp. 50, tables 27. Berkeley, Cal., 1924.

The purpose of the Bulletin is to show from actual field records the influence of fertilisation, ploughing, climate, soil, age of trees, and costs, on the profitableness of citrus orchards.

The following conclusions are drawn from data collected from about 600 citrus groves, only records being used for analysis that covered a working period of five years.

Citrus groves (in California) produce more fruit per acre near the coast than in the interior, but they do not return higher net profits.

Soils of a medium texture are mainly used, as very sandy soils or clays are less productive.

Citrus trees usually increase in average yield until at least thirty-five years of age.

Nitrogen and bulky organic manures give the best results. Exclusive applications of nitrogen seem to cause mottling.

Orchards with winter cover-crops gave higher yields than clean-cultivated orchards.

Less irrigation water should be used near the coast than in the interior.

Forestry and Agriculture.

MARSHALL, R. C. (Conservator of Forests, Trinidad and Tobago). "Tropical Agriculture," Vol. II., No. 4, pp. 70-72. Trinidad, 1925.

Forestry and agriculture are both based on the yield-capacity of the soil; trees are often far less exacting in their soil requirements than are agricultural crops, and can be successfully grown on areas which are quite unsuitable for agriculture.

The indirect utility of forests.—The opinion is widely held that forests increase rainfall to a marked extent. Ebermayer started observations in Bavaria in 1867, but came to the conclusion that in the plains the effect of forests is very small, but increases with elevation. Extensive observations made in Sweden at 400 stations over a period of fifteen years showed that land with 56 per cent. under forest certainly did not receive more than 3 per cent. rainfall in excess of land with 17 per cent. under forest. The Government of India has studied the subject and concludes that, if forests influence rainfall at all the effect is insignificant.

Forests, however, have a profound effect on the conservation of water. The trees lessen the force of heavy, tropical rainfall; the surface soil in a forest consists of decaying organic matter capable of absorbing large quantities of water, which is held and eventually passes out as springs which yield a steady supply to streams and rivers. A tropical rainfall on a bare hill-side is not absorbed, and causes erosion of the soil and floods in the valleys.

The direct utility of forests.—Forests, in addition to timber, produce many important secondary products. In countries where forests have reached the protection stage, yield tables are available from which the average annual return per acre can be calculated. From the standard formula, under a given set of conditions, the return per acre works out at 18s., and unless this return can be obtained by agriculture it is preferable to grow timber on that area.

Every acre of land round head-waters and along the banks of rivers on which forest cover would protect against erosion and soil wastage, should be forested. All forested lands should be so managed as to yield a maximum of the products most needed by the local communities and industries.

Without agricultural development the present state of civilisation cannot be maintained. We had better be without gold than without timber.

The Growing of Poles for Electric Transmission.

GOUDIE, H. A. (Conservator of Forests, Roturva, N.Z.). "New Zealand Journal of Agriculture," Vol. xxix., No. 4, pp. 243-253, figs. 3. Wellington, 1924.

In writing the article the author had in mind the great development which is taking place in the production and use of electricity, and the very large demand likely to exist in the future for poles for extension of power lines and renewals. It is estimated that for renewals alone, in addition to telegraph and telephone pole requirements, 40,000 poles per annum will be necessary.

The main qualifications required of a pole are strength and durability, hence only poles of the highest quality are employed. For this purpose Australian ironbark poles are used of the following species: Grey or white ironbark (*Eucalyptus paniculata*), broad-leaved ironbark (*E. siderophloia*), narrow-leaved ironbark (*E. crebra*), and red ironbark (*E. sideroxylon*). Although the main object of the article is to deal with the growing of trees for pole-production, the author describes species and varieties recommended for farm forestry. Attention is drawn to the advantages of planting the waste places on a farm with trees, which in most cases may just as well be valuable, timber-yielding species, as trees which have a shelter value only.

PLATE 3.—A FREAK SEEDLING PINEAPPLE (SMOOTH LEAF), THE FIRST FRUIT OF A NEW PLANT FROM MR. J. DENNIS'S GARDEN AT LOGANLEA, AND FORWARDED BY MASTER DENNIS.

The specimen weighed 11 lb. and was grown in loam on a clay bottom.

THE PINK BOLL WORM.

(*Platyedra gossypiella* Saunders).

BY E. BALLARD, B.A., F.E.S., Commonwealth Cotton Entomologist.*

Historical.

The insect which is now known as the Pink Boll Worm was first recorded as a pest of cotton in India in 1842. For sixty years or more nothing was heard of it until a German paper, published in 1904, described its depredations in German East Africa. In 1909 an account was given of loss caused by it to cotton in the Hawaiian Islands, into which it had been introduced from India. Cotton-growing in Hawaii was subsequently abandoned on account of it. In 1906-7 it was introduced into Egypt, and since that date has done some £50,000,000 worth of damage.

It was frequently reported as damaging cotton in India, Burmah, and Siam, affecting exotic cottons more than indigenous varieties. This selection of plants by the insect is still made in India. Numerous papers have been published dealing with the life-history and control of the Pink Boll Worm, Egypt, United States of America, and India all contributing their quota, the most exhaustive research having been done in Egypt.

Distribution.

Complete data of the original distribution of *Platyedra gossypiella* are not yet forthcoming. It is undoubtedly of Oriental origin, and may belong to part of the Australo-Oriental region as well. Its Eastern range will probably be found to be more extensive than was at first supposed. It is now established in all, or nearly all, cotton-growing areas, exceptions being West Africa, Turkestan, and South Russia. No records exist which would enable one to ascertain whether or not it is indigenous to the Western Districts of Papua or, if not indigenous, when it was introduced. It is present in the "dry belt" of Papua (50 miles east and west of Port Moresby) and in and around Rabaul. Previous to 1912 it had not been recorded from Rabaul, and it has probably been introduced since that date.

Nature of the Damage done.

The Pink Boll Worm is the only pest of cotton which is carried in the seed. For this reason special precautions have to be taken when cotton cultivation is carried on in areas infected by it.

A short description of its habits will better enable the cotton planter to understand why these precautions are necessary.

The moth of the Pink Boll Worm is a small grey-brown insect, measuring about three-quarters of an inch across the outstretched wings. It is about the size of a clothes moth, and the tips of the fore wing are

*In a pamphlet published by the Home and Territories Department for circulation in Papua and Mandated Territories under Commonwealth control.

pointed. The hind wings are more rounded and are lighter than the fore wings and heavily fringed. It is crepuscular in its habits, and hides by day in sheltered dark spots, such as under fallen leaves and other débris always present in a cotton field. The female moth lays its eggs usually on the inner side of the bracts of the cotton boll or on the tip of the boll, or in the flowers. The eggs are small, whitish, scale-like objects, longitudinally ribbed, and when seen under a low-powered microscope appear iridescent. They may be laid singly or in small groups. They hatch in from four to twelve days.

From them emerges small, colourless, hairless caterpillars with dark heads, which immediately bore into the boll. The whole of the caterpillar stage is passed inside the boll, the seeds being eaten and hollowed out. The caterpillar casts its skin a certain number of times, and as it grows older the characteristic pink colouration appears. This colour is sometimes more or less evenly distributed over the whole dorsal surface of the body, but is often concentrated into spots. When full grown the caterpillar is about half an inch long. One characteristic of Pink Boll Worm attack, which distinguishes it from other boll worms, is the neat way in which the caterpillar works. It does not fill the boll with a mass of excreta like other boll worms. When full grown it cuts a hole to the exterior through the boll wall. This escape hole is very characteristic. It is small and oval in shape and quite different from the larger round holes cut by other boll worms (*Earias* sp and *Heliothis*).

After this is done, the caterpillar becomes a pupa. The pupa is about two-fifths of an inch in length, a bright chestnut brown, and is generally to be found inside a seed. At times it is to be found in the lint in the open boll. The caterpillar may leave the boll and pupate in a crack in the soil or under fallen leaves, &c. In due course the pupa gives rise to the moth, and the cycle starts again. As each female moth can lay up to 600 eggs, it will be obvious that a light infection soon gives rise to a very large number of boll worms.

As the season advances, the population increases very rapidly. The whole life-history only occupies about twenty-one to twenty-eight days, although this is dependent on certain climatic factors.

Long Cycle Larvæ.

In some countries where there is a prolonged dry season or cold winter the caterpillars or larvæ of *Platyedra gossypiella* have the power of remaining in a dormant condition for long periods, extending even up to two years. This resting stage larva is generally known as the long cycle larva. When in this condition the larva does not feed, but remains inside a seed with the entrance hole spun over with silk. Very often another seed is spun to the one containing the larva, thus forming what is known as a double seed. It is by means of these double seeds that the Pink Boll Worm has been carried all over the world.

Under certain conditions the caterpillar stage is prolonged, and, although the larva continues to feed, it takes a considerable time to become mature and pupate.

Some of the symptoms of Pink Boll Worm attack have already been noted. Others are: Flowers failing to open but remaining in a stage when they look like a rose bud, sometimes squares will be attacked and

shed, and another diagnostic character is the presence of a neat round hole in the septum between the locks in a cotton boll. Premature opening often results from Pink Boll Worm attack.

The whole of the damage is done by the caterpillar, but while the crop is growing nothing can be done to check the loss which is being caused.

Control.

Something can be done at the end of the season. The great sources of danger are the long cycle larvæ and careless cultivation. The long cycle larvæ can be destroyed by means of heat. All seed intended for sowing should be treated by heat by exposing it to the sun for about one hour so that it is raised to a temperature of at least 60 degrees C. (140 degrees F.). This can be done by spreading the seed thinly on mats or corrugated iron sheets. The temperature should not exceed 150 degrees F. (65 degrees C). Another method is to heat the seed in machines specially designed for the purpose, as is done in Egypt and Queensland.

In addition to ensuring seed free from boll worms, all refuse from the cotton bushes must be cleaned up and burnt, as otherwise a shelter is provided for long cycle larvæ. If plants are left to stand over at the end of the season, when in all probability the boll worm population is high, any new crop planted will be infested early, as the boll worms will get a flying start, and bolls forming on the last season's bushes will also be destroyed. In climates like those of Papua and New Guinea cotton will go on flowering all the year round. For this reason there may be some reluctance to plough out a crop which is apparently still bearing. Cotton-growers must make up their minds to make this apparent sacrifice in the interest of the succeeding crop. The sacrifice will be more apparent than real, for a close examination will show that most bolls at the end of the season are damaged and stained and would only produce low-grade cotton. This close season should be of at least two months' duration.

Cotton after it is picked often lies in store for some time awaiting transport. This cotton when infested with boll worms is producing moths the whole time (they can always be seen flying about in a place where seed cotton is stored). These moths are flying out every evening and reinfecting the crop. (Cotton and Malvaceous weeds related to cotton, when growing near a cotton ginnery, are always heavily infested with Pink Boll Worms from moths coming from the stored cotton awaiting ginning.) Stores where cotton is likely to be kept for any time should be made moth-proof. Ordinary mosquito netting would be sufficient for this purpose, and the door need only be closed just before sunset.

The Pink Boll Worm is rightly regarded as one of the most important insect pests of cotton, ranking with the boll weevil of America and "stainers." Its power of being transported in seed and its resistance to drought and flood, its short life-history, and its rapid multiplication, all combine to make it an insect to be dreaded, and against which all possible precautions should be taken. If these precautions are taken, it will be quite possible to raise good cotton crops; without them it is waste of time and money, as many have found to their cost.

List of Illustrations.

From photographs by H. Kirkpatrick, Tallulah, Louisiana Laboratory.

From Bulletin No. 723, United States Department of Agriculture, by W. O. Hunter.

FIG. 1.—The Pink Boll Worm Moth (*Pectinophora gossypiella*): Adult. Much enlarged. (Busck.)

FIG. 2.—The Pink Boll Worm: Outline drawing of larva, showing structure. Much enlarged. (Busck.)

FIG. 3.—The Pink Boll Worm: Pupa. Much enlarged. (Busck.)

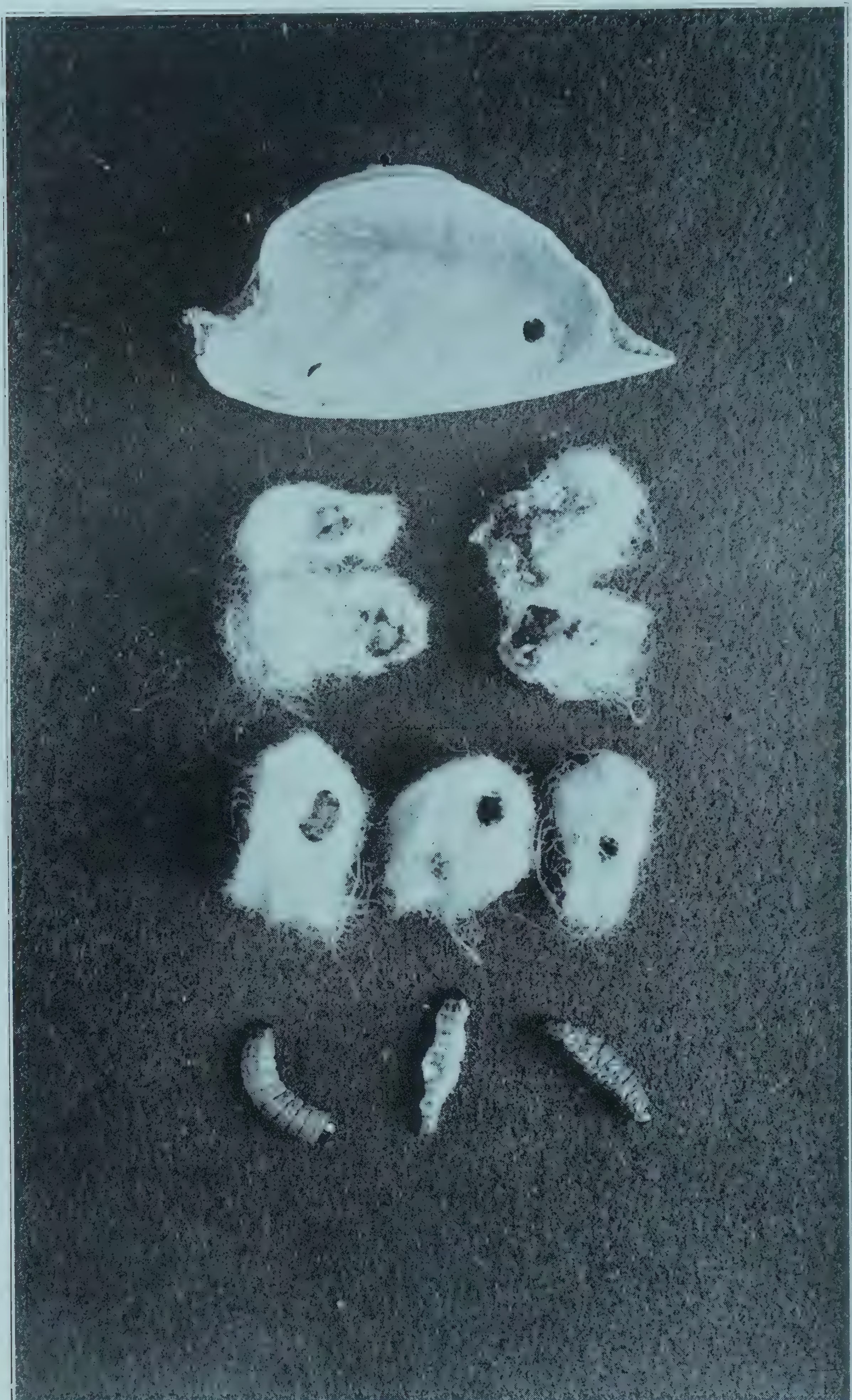

FIG. 4.—Pink Boll Worms, double seeds, and characteristic hole in boll partition.

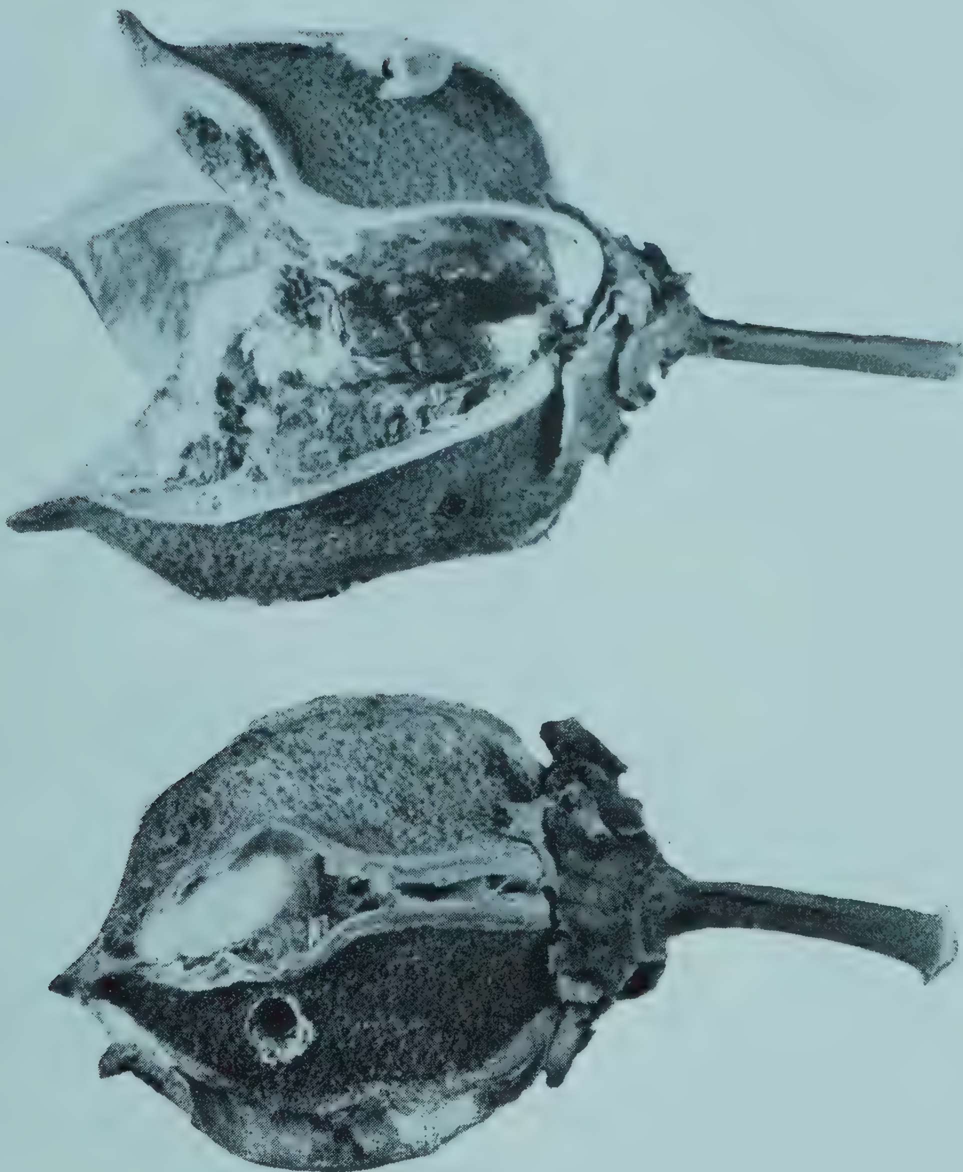

FIG. 5.—Left: Boll showing characteristic hole in carpel made by *Heliothis obsoleta*. Right: Boll showing two characteristic openings in carpel made by Pink Boll Worm.

FIG. 6.—Contents of three locks showing characteristic injury. Note the massing of the seed cotton and the "clean" character of the work.

QUEENSLAND SHOW DATES, 1926.

Stanthorpe : 3rd to 5th February.
Warwick: 9th to 11th February.
Allora: 17th and 18th February.
Clifton: 24th and 25th February.
Newcastle (N.S.W.) : 23rd to 27th Feb.
Killarney: 10th and 11th March.
Milmerran: 31st March.
Sydney Royal: 29th Mar. to 7th April.
Herberton: 5th and 6th April.
Miles: 7th and 8th April.
Pittsworth: 8th April.
Chinchilla: 13th and 14th April.
Kingaroy: 15th and 16th April.
Toowoomba: 20th to 22nd April.
Nanango: 29th and 30th April.
Dalby: 29th and 30th April.
Taroom: 3rd to 5th May.
Oakey: 6th May.
Toogoolawah: 6th and 7th May.
Murgon: 6th and 7th May.
Goombungee: 13th May.
Boonah: 12th and 13th May.
Kilkivan: 12th and 13th May.
Roma: 19th and 20th May.
Wondai: 19th and 20th May.
Ipswich: 19th to 21st May.
Wallumbilla: 25th and 26th May.
Esk: 26th and 27th May.
Maryborough: 25th to 27th May.
Childers: 29th to 31st May and 1st June
Marburg: 2nd and 3rd June.
Bundaberg: 3rd to 5th June.
Gin Gin: 8th to 10th June.
Woombye: 16th and 17th June.
Lowood: 18th and 19th June.
Gatton: 30th June and 1st July.
Kilcoy: 1st and 2nd July.
Laidley: 7th and 8th July.
Biggenden: 1st and 2nd July.
Woodford: 8th and 9th July.
Wellington Point: 10th July.
Maleny: 21st and 22nd July.
Rosewood: 23rd and 24th July.
Royal National: 9th to 14th August.
Crow's Nest: 25th and 26th August.
Coorparoo: 28th August.
Wynnum: 3rd and 4th September.
Zillmere: 11th September.
Rocklea: 25th September.

REPORT ON THE COTTON BREEDING OPERATIONS IN QUEENSLAND.

By W. C. WELLS, Cotton Specialist.

The recent revival of the cotton growing industry in Queensland on a scale of some importance quickly brought up the problem of the supply of pure seed of varieties of cotton suitable for the climatic and soil conditions of the State. Importations of seed of many varieties of the American Upland and the Egyptian types had been made on several different occasions by the Department of Agriculture, but these supplies of seed had been used mostly in variety tests with a consequent mixing, not only by the process of cross-pollination in the field but also in the process of the ginning of the seed cotton.

Early History of Durango Cotton.

Realising that such a mixture of the seed of the varieties and the hybrids thereof would produce a very uneven lot of cotton, the Australian Cotton Growing Association in 1921 imported 327 lb. of the Durango variety of American long-staple Upland cotton. This variety had been bred by the United States Department of Agriculture from seed imported from Mexico, and had given excellent results over a wide range of climatic and soil conditions. Most of the seed obtained in this importation was planted by Mr. A. S. Bailey on his place at Capella, an area of 3 acres being planted, which produced 2,116 lb. of seed cotton.

Season of 1922-23.

This seed was distributed in the following season (1922-23) to farmers who agreed to grow small plots of the variety under conditions of special isolation—land not previously in cotton and at a distance of at least a mile from any other cotton being required. These plots were located so as to test the variety under a wide range of climatic and soil conditions.

Unfortunately, the season of 1922-23 was characterised by a severe drought existing in nearly all of the districts in which the Durango test plots were located, so that many of them were complete failures, due to lack of sufficient moisture to obtain a germination of the seed. However, enough of the plots came through to maturity to produce a total of 32 bales of lint—which were fairly representative of the various sections of the cotton belt.

Samples of these bales were drawn and forwarded to the British Cotton Growing Association in England for a report on the merits of the lint. This Association

kindly secured the services of Messrs. Wolstenholme and Holland, an old Liverpool firm of cotton brokers, to report on the cotton, which was as follows:—

Mark.	Classification, &c., by Wolstenholme and Holland.	Grower.	District.
1	Barely Middling Fair. Staple full $1\frac{1}{8}$ in., strong	Hunt Brothers ..	Alton Downs
2	Barely Good Middling. Staple about $1\frac{3}{16}$ in., fairly strong.	Drummond, W. H. ..	Springsure
3	Fully Good Middling. Staple about $1\frac{1}{8}$ in., irregular, rather soft	Grey Brothers ..	Wetheron
4	Fully Middling. Staple $1\frac{3}{16}$ in., irregular, rather soft	Prichard and Wannop	Archer
5	Fully Good Middling, Staple $1\frac{1}{8}$ in., not very strong	Grey Brothers ..	Wetheron
6	Middling Fair. Staple full $1\frac{1}{8}$ in., strong and regular	Suley, J.	Wallumbilla
7	Fully Good Middling. Staple barely $1\frac{3}{16}$ in., strong	State Farm	Roma
8	Barely Middling Fair. Staple $1\frac{3}{16}$ in. to $1\frac{1}{4}$ in., fairly strong	Park Brothers ..	Yamala
11	Fully Good Middling. Staple full $1\frac{1}{8}$ in., strong	Prichard and Wannop	Archer
12	Good Middling. Staple irregular, average $1\frac{3}{16}$ in., rather weak	Hall, F. R.	Samford
14	Fully Good Middling. Staple $1\frac{3}{16}$ in., very strong	Turner, A. J.	Ubobo
15	Fully Good Middling. Staple $1\frac{1}{8}$ in. full, wasty	Prichard and Wannop	Archer
16	Fully Good Middling to Middling Fair. Staple $1\frac{1}{8}$ in. full, rather soft	Rosenburg, —. ..	Ma Ma Creek
17	Fully Good Middling to Middling Fair. Staple about $1\frac{3}{16}$ in., fairly strong	Gibb, R.	Mecandah
18	Fully Good Middling to Middling Fair. Staple $1\frac{3}{16}$ in., strong	McKenzie, A.	Mecandah
19	Fully Good Middling. Staple $1\frac{1}{16}$ in., weak	Bailey, A. S.	Capella
20	Fully Good Middling. Staple $1\frac{1}{8}$ in. to $1\frac{3}{16}$ in., strong	Turner, A. J.	Ubobo

The Season of 1923-24.

The report on the samples and the prices received for the bales of Durango were considered to be very satisfactory, especially when the climatic conditions of 1922-23, under which the variety had been grown, were taken into consideration. Accordingly the Department of Agriculture felt justified in further distributing the seed of this variety, and in the next season, 1923-24, sufficient seed was distributed to plant approximately 3,000 acres at the rate of 10 lb. of seed per acre.

The spring of 1923-24 was exceptionally dry and a large acreage was not planted, or if planted failed to develop during the extremely hot weather of November. General rains falling in the middle of December relieved the situation to a marked degree, and it appeared by the middle of January as if a heavy yield could be expected. Unfortunately, severe attacks from various boll worms and insects were experienced during the latter part of January, and in many cases all of the crop of fruit was destroyed. This period was followed by an extremely wet February in many parts of the cotton belt, the effect of which was to develop a very rank-growing type of plant, the foliage of which was so dense as to preclude any possibility of the sunlight penetrating to the lower parts of the plant. In consequence, the excessive humidity greatly assisted the development of various boll rots and any bolls remaining on the lower branches were attacked, resulting in a total loss of the bottom and lower middle crops.

There are no records available as to the acreage of Durango which was picked that season, as many of the growers did not pick over the whole of their crop, the yields in parts of the fields not warranting the expenditure of labour. It is impossible, therefore, to state the acreage actually picked, but a rough estimate of 1,200 to 1,500 acres would be somewhere near the mark. A total of 257 bales of lint were produced from this acreage, which on the whole was of good quality.

The quality of the ordinary Queensland cotton of the 1923-24 season was so distinctly inferior to that of previous crops that it was very apparent the supply of seed of the Durango variety should be increased rapidly in order to have sufficient to enable the Durango cotton to supplant the ordinary Queensland cotton.

Season of 1924-25.

Accordingly the old areas which grew Durango in 1923-24 were planted solidly to Durango in 1924-25 and several new areas were taken in as well. The distribution can be divided roughly into the following districts:—Marlborough, Mount Larcom, Raglan and Marmor areas, Boyne Valley, Miriam Vale, Yarwun, &c., Dallarnil and Mount Perry, Gayndah line, Kingaroy line, Upper Burnett, Callide Valley, Lockyer.

Generally speaking, great difficulty was experienced in obtaining good strikes of Durango in nearly all the districts south of Bundaberg until the latter part of October. This was due mostly to the desire of the growers to get an early planted crop, as the experience of the previous season had shown that the early planted cotton had given the best average results. The season gave promise of being an early one—the days warming up appreciably in the latter part of August. The night temperatures, however, remained at a low level and, following a series of light general rains during the first half of September, the weather turned decidedly cooler and was not favourable at all to the securing of good strikes. This condition was further aggravated by heavy storms occurring in the southern areas, with such force, in some cases, as to wash the seed out of the ground. The crusting of the surface soil, in conjunction with the cold temperatures, necessitated a large percentage of the early sown crop being replanted, so that as a whole it might be said that the crop of the past season was planted in October and the first half of November.

The growing period of the 1924-25 season has been characterised by very favourable to excessive rainfall conditions during the early part; very poor rainfall conditions in the southern portion, good in the Gayndah, Kingaroy, Upper Burnett, Dallarnil, Boyne Valley, Mount Larcom, Raglan, and Marlborough areas, and poor to fair in the Callide areas, in the middle of the season up to the end of January; and extreme droughty conditions, broken by light showers of no value, in nearly all of the belt during the latter part.

The erratic climatic conditions in some areas had a marked effect on the yield and the quality of both the Durango and the ordinary Queensland cottons. The southern portion, with the exception of a few areas, experienced a severe drought and heat wave at the critical stage in the development of the fruiting system, resulting in very low yields being received. The lint of the Durango crops varied from $1\frac{1}{8}$ to $1\frac{3}{16}$ in. in length, was of light body, somewhat weak in strength and of a tendency to softness. The ordinary cotton was also affected in similar manner, the length of fibre being less than 1 in. in many samples.

In the areas of Durango cotton which enjoyed better growing conditions at the critical stage of development, very good yields were received—the Upper Burnett and the Boyne Valley districts in particular being fortunate in this respect. The Upper Burnett Settlement Scheme had roughly 640 acres of pure Durango come to maturity, with yields varying from 600 to 1,500 lb. per acre. The State Farm at Monal Creek in this area approximated 1,350 lb. per acre over the whole crop of 21 acres, which consisted of many kinds of experiments, &c. In the regular plantings similar to the commercial system of spacing, &c., as high as 2,190 lb. per acre were recorded.

The quality of this cotton was excellent, the length of fibre being of $1\frac{1}{8}$ full to $1\frac{3}{16}$ in., of good sound body and strength. The major portion of the consignments from the district received A, B, or C grades at the ginnery, with a small amount of X, indicating that very little cotton was received which was of a tender or immature staple.

The average yield per acre in the Boyne Valley was slightly less, due to the extreme heat wave which that section experienced during the latter part of February, causing a total loss of top crop in many instances; yields from 600 to 1,000 lb. were obtained, however, the quality of which was somewhat affected by the above-mentioned heat wave. The fibres were of good length—$1\frac{1}{8}$ to $1\frac{3}{16}$ in., but on the tender side, with a fair amount of immature fibres from the upper bolls of the middle crop. If this valley had not experienced the heat wave, undoubtedly a cotton of good sound quality would have been received from most of the crops.

The crops of Durango in the Callide Valley suffered from the heat wave as well as a long period of drought, which existed from early December to the latter part

of January—the critical stage of the development of the fruiting system. The crops of the farmers were planted somewhat on the late side, due to late occupancy of the land; but in spite of this handicap and the heat wave, made as much as 800 lb. of seed cotton per acre. Under more favourable conditions many of the crops would have exceeded this return.

The Cotton Research Farm at Biloela, in the Callide Valley, made as high as 1,400 lb. seed cotton per acre on early October plantings on well prepared land, and 800 lb. seed cotton on late prepared newly-cleared land, so that as far as yields per acre are concerned the variety seemed to be suited to the area.

The quality of the fibre was affected by the heat wave and droughty conditions, the staple being $1\frac{1}{8}$ to $1\frac{3}{16}$ in. in length, but of decidedly light body, of a tendency to be soft and somewhat lacking in strength. This was not surprising in view of the droughty conditions under which the cotton had been grown.

The cotton crops in the Marlborough, Raglan, and Mount Larcom areas, as well as any individual planting between these districts, were as a whole somewhat disappointing on account of the attacks of the Pink Boll Worm. This applied to both the ordinary and the Durango cottons. The Durango fibre produced under such conditions while of good length, was weak and wasty, and often was tinged with spots of discoloration from boll rots, &c., entering the bolls at the point of attack of the Pink Boll Worm. The Mount Larcom area in particular suffered heavily from the depredations of this insect, many of the crops being complete failures.

It is interesting to note that the system of ratooning the previous crop had many advocates in this section, and that the majority of the farmers left their crops standover until as late as October, when examination showed that as high as 70 per cent. of the plants in some fields were dead from winter-killing. The crops were uprooted and burned then and the ground prepared, but sufficient rains for planting did not fall until November, the result being a very late planted crop for most of the district. As the Pink Boll Worm had been in the crops of the previous season, such a delay in destroying the old crop must have been of assistance in carrying over a large population with the consequent heavy infestation of the new crop, which resulted in a total loss (as has been pointed out) over most of the Mount Larcom area.

This same situation was met with in the Bajool and Marmor areas, and the question now arises as to the possibility of controlling this pest in these areas sufficiently to enable the farmer to grow a profitable crop.

All of the seed issued for planting purposes has been treated in the Simon's Heater for this and last season's requirements, in order to insure the distribution of only insect-free seed. The final solution of the control of the Pink Boll Worm rests with the farmer, however, as the early eradication and burning of the old crop of stalks offers the best means of combating the spread of this insect.

The results received from the Durango variety in the other areas mentioned, such as Thornton Valley in the south, Goomeri and Murgon on the Kingaroy line, and Wetheron and Degilbo on the Gayndah line, indicated that under proper cultural conditions equally good or better yields could be obtained on any of the soils where the ordinary cotton could be grown successfully. This, in conjunction with the fact that the Durango lint is of a superior texture and staple, and highly suitable to the securing of good premiums over the prices obtained for the ordinary cotton, has led the Department of Agriculture and Stock to feel justified in distributing Durango seed to everyone desiring seed of this variety for the season 1925-26. In some cases the growers have asked for the old seed. One thousand acres of seed has been issued up to 1st October, 1925, as against 40,000 acres of Durango seed.

The Department has never maintained that the Durango variety is the most suitable for Queensland conditions, but as the variety is the only one of any large amount of pure seed that is here and the various tests having shown good results, this variety has been distributed in preference to the ordinary Queensland seed which is of such a mixed nature and of a poor class of staple.

Breeding Operations.

Realising that an imported variety would develop slight irregularities in plant and fibre, characters due to the "new place effect" from being grown under new and different conditions, the Cotton Office has been doing selection work in this variety for the last two seasons. In 1923-24 a 30-acre field of well-grown Durango at Miriam Vale was carefully inspected, plant by plant, and fifty-seven plants of exceptional promise were selected for further progeny material.

In addition to these special selections a bulk selection of plants approaching the true Durango type, was made in order to have sufficient seed of a uniform type to plant the 30-acre field in the following season. Some 337 lb. of seed cotton were selected in this manner and ginned on a special small gin to ensure that no mixture of seed occurred during the ginning operations.

The seed from this cotton was planted in the 30-acre field this past season, but, unfortunately, this section experienced a very wet season, with the result that the grass choked out a fair percentage of the strike and the boll rots accounted for a good portion of the crop from the remaining plants. Sufficient seed was obtained to plant approximately 130 acres—100 of which are being planted with selected farmers in the Boyne Valley in the season 1925-26.

A portion of this area will be carefully inspected and a sufficient bulk selection made to plant another isolated plot next season. The seed cotton from the crops of the selected growers will be segregated and ginned separately, and will be distributed to the Boyne Valley areas next season in order that a pure seed area may be established from which to supply a good portion of the whole of the coastal areas' requirements.

It is realised that such a system does not produce a pure strain of cotton but it does assist in developing on a large scale, and in a comparatively short space of time, a stock of seed which is sufficiently uniform to produce a good commercial cotton, and thus meet the pressing need for supplying a better cotton than the existing varieties.

The Technique of Selection Work.

When selecting material for progeny investigation in a variety of cotton which is showing "new place effect" or "splitting up," it is necessary to attempt to classify the plants in the field under observation into definite types before making any selections. This familiarises one with the degree to which the variety is splitting up, and also assists in determining just what type appears to be the most suitable for further investigation.

Durango Plant Types.

Careful analysis of the plants in the field of Durango at Miriam Vale in 1923-24 showed that although the variety was breaking up into several types, two of these were especially well defined, and the majority of the plants conformed to one or the other in approximately equal numbers. These, while entirely different as regards the structure of the plant, were both desirable, and as many especially promising individuals of each were secured as could be found.

The type of plant most closely approaching that to which the variety was bred to in the United States was described as A. This is an erect plant of open habit of growth, due to the length of distance between the joints of the main stalk bearing the fruiting branches and the long spaces between the joints of the fruiting branches where the bolls are borne. As the fruiting branches of this type of plant are often of 6 to 8 joints in length, the sunlight and air are allowed to penetrate to the bottom part of the plant, and thereby be of marked assistance in reducing the damage caused by boll rots during periods of excessive rainfall. This type is considered to be especially suitable to the coastal areas and the selections of this nature have been kept in the coastal districts.

The other major type of plant was of a more decided stiff, erect, appearance, the joints on both the main stalk and the fruiting branches being set closer together than those of the A type. The leaves were somewhat larger and the fruiting branches of fewer joints in length. There was also more of a tendency to produce vegetative branches. This type, which was called B, appears to grow well in the more inland areas, so that its behaviour is being tested out carefully in the Callide Valley and at the Warren State Farm.

Investigations conducted at the Monal Creek Demonstration Area and at the Callide Cotton Research Farm during this past season showed that the two types of plants were existing in the crops at these inland areas, so that there appears to be a well-defined division of types in the variety. Curiously enough the B style of plant occurred in far greater numbers in the inland areas than on the coastal areas, except on light sandy soils near the creek banks, where nearly every plant was of a good A type.

Durango Progeny Centres, 1925-26.

During the coming season there will be progeny investigation in Durango cotton at the Callide Cotton Research Station, at the Warren State Farm, at Mr. A. J. Turner's, of Ubobo, and Mr. J. Monaghan's, of Nagoorin. These areas represent soil and climatic conditions as follows:—

Callide.—Alluvial soils under the dry inland climatic conditions, with a rainfall of 28.6 in.

Warren.—Mixed forest soils of a light grey clayish nature, and a rainfall of about 29 in.

Ubobo and Nagoorin.—Sandy loam alluvial soils under semi-coastal conditions, with a rainfall of about 35 in.

In addition to these areas it is anticipated that progeny work will be commenced this season at a representative centre on the Gayndah line and in the Thornton area in the southern district, so that next season will see all the main areas of the State having progeny investigations in Durango cotton under way.

Technique of Laboratory Investigations of Selections.

Not only are the selected plants carefully described in the field, but material for laboratory studies is collected as well. This generally consists of a collection of five average bolls of the number of locks that the majority of the bolls on the plant contain. The rest of the bolls are picked in bulk, keeping each plant separately.

Later in the season when all of the material has conditioned to about the same degree, the five-boll samples are worked up in the laboratory on the lines shown in the sample chart illustrating the various characters studied.

The results of these determinations are then studied in conjunction with the plant descriptions which were made in the field, and the most promising of the selections from each district are reserved for further progeny study in the following season. Under the progeny system, fifty hills of each reserved selection are planted—one selection to a row, the rows spaced 4½ feet, and the hills 2 feet apart. The selections are arranged in the order of their value, so that the best has the next best to it, &c.

These progeny groups are inspected carefully before the flowering season has commenced and any rows showing a marked diversity are eradicated in order to prevent any possible cross-pollination taking place with the more uniform progenies.

The block is examined again at the time of maturity, when the fibres of every plant are examined. The most uniform row containing the characters of the desired type is considered as offering the most promising material for further investigations. The best plants in this row are reserved for progeny material in the following season, and the rest of the row is picked in bulk for planting as a seed increase plot under isolated conditions in the next season.

The following chart illustrates the system being used by the Cotton Office in developing strains of pedigreed seed. Under such a system a stock of carefully bred seed is being propagated for distribution in the particular district in which it has been developed, so that the grower is assured of receiving acclimatised seed suitable for the general soil and climatic conditions of his own section.

First Year.
A single plant selection. →

Second Year.
A progeny row of from 50 to 100 plants, in hills 2 ft. apart, one plant to the hill. →

Every plant in this row is carefully inspected on many characters to ascertain the degree of uniformity being obtained in the progeny row. If the majority of the plants appear to be of the desired type in most of their characters, the row is considered to be promising material from which to obtain an improved strain of cotton.

Several of the plants which approach nearest to the desired type are selected for further careful inspection, and the crops from each of the best four or five plants are saved separately for further progeny row material. ↓

Third Year.
A small isolated plot planted from the bulk pickings of the progeny of the second year. →

Every plant in this plot is carefully inspected, and any plants not conforming to the desired type are destroyed. This operation is done twice—once at the beginning of the flowering period so as to avoid cross-fertilization, and later, when the bolls are open, so as to examine the fibres. These operations are known as "rogueing."

Fourth Year.
An increased planting of seed obtained from the "rogued" plot. →

An inspection is made of this field to ascertain the uniformity being obtained, and any badly "off-type" plants are destroyed.

Fifth Year.
A commercial planting of the seed produced from the increased planting plot of the fourth year.

Second Year.
The best plant of the progeny row. →

A progeny row planted from seed of the best plant in a similar manner as the parent progeny row. →

This row is very carefully inspected, and the best four or five plants of the desired type are selected for further progeny studies similar to the parent plant of the progeny. ↓

A small isolated plot planted from the bulk pickings of the remaining unselected plants of the progeny row. →

This plot is inspected as in the case of the small isolated plots in the third year column.

An increased planting of the "rogued" seed obtained from isolated plot of the fourth year.

Third Year.
The best plant of the progeny row. →

Treated similarly to the progeny row of the third year column. → ↓

Treated similarly to the small isolated plot of the fourth year.

Fourth Year.
The best plant of the progeny row. →

Treated similarly to the progeny row of the fourth year. ↓

Fifth Year.
The best plant of the progeny row.

NOTE.—The rest of the best four or five plants of the progeny are planted as well and treated in a similar manner. Only one plant is used in the diagram in order to simplify the illustration. If the progeny row of any of these selections lack uniformity in any of the characters under observation, it is rejected as being unsuitable for further propagation. Usually, the most uniform progeny is considered to offer the best promise of quickly obtaining a uniform strain, and further work is confined to this one line.

Investigations in other Upland Cottons.

The Department of Agriculture has not devoted the whole of the breeding work to the Durango variety. It has been realised all of the time that this variety may not be the most suitable cotton for Queensland conditions. Accordingly, other American Upland varieties with habits of growth thought suitable to the conditions here have been introduced. These include the following varieties:—Acala, Lone Star, Webber 49, Delta-Type Webber, and Lightning Express.

Acala Variety.—This is an Upland type of cotton of original Mexican origin which has been developed by the United States Department of Agriculture. In that country the variety has been found suitable for a wide range of conditions, some of which closely approach those existing in Queensland. The plant is of an erect growth, of average open structure, a heavy cropper, and bearing bolls averaging 50 to 60 to the lb. of seed cotton. The lint is of $1\frac{1}{8}$ to $1\frac{3}{16}$ inches in length, strong, heavy-bodied, and of excellent character.

The seed of this variety was obtained from the United States Department of Agriculture Experiment Station located at Shafter, California, in 1923. The breeding operations in it have been confined to the Queensland Agricultural College at Gatton. Selections were made in the first season that it was grown, 1923-24, and some twenty-one were reserved for further investigation. These were planted under isolated conditions during the season 1924-25, and of the group one progeny was found to be of good promise, both in lint and vegetative characters. Several good plants were selected in this row and will be planted in progeny groups this coming season.

In addition to these, some 150 new selections were made in the bulk increase planting, sixteen of which have been retained for further study in the progeny blocks of this year.

This variety appears to be well suited to the conditions of the Southern districts, and for this season, small isolated test plots covering practically all of the soil conditions, have been arranged to ascertain the behaviour of the variety under such a wide range of conditions. Several small plots have also been arranged in which the Acala and the Durango varieties are grown side by side in five-row plots.

Similar programmes have been arranged in the Gayndah-Kingaroy areas and in the Central district, so that by the end of the present season considerable data will be at hand as to the comparative merits of the two varieties. It is pointed out, though, that neither of these two varieties is thoroughly fixed as regards uniformity of type, &c., so that final judgment may have to be reserved until pedigreed seed of both varieties is available. It has been the aim of the department to study the behaviour of each variety separately, and to develop the best strains appearing in the varieties before making any definite decisions as regards the suitability of the varieties. In another season it is anticipated that considerable progress in this work will have been accomplished, so that it appears desirable that the preliminary work of comparing the varieties may be commenced this season, bearing in mind that the results must be interpreted in relation to the types which are being evolved.

Lone Star Variety.—This is a big boll type of Upland cotton bred by the United States Department of Agriculture in the State of Texas. It has been found to be very suitable to climatic conditions closely approaching the inland sections of Queensland. Unfortunately, the average length of the fibre of this variety, which has been grown the last two seasons, has been of $1\frac{1}{16}$ to $1\frac{1}{8}$ inches. Owing to the attractive premiums being obtained for cotton of $1\frac{1}{8}$ inches and upwards in length and the fact that the costs of production of cotton are high in this country, it is believed that every attempt should be made o produce cotton of hese classes rather than shorter lengths. The development work in this variety will consist, therefore, of attempts to obtain a type of plant containing the desirable features of the variety as regards growth and size of bolls, but with an increased length of staple.

Webber 49.—This variety has been tested for two seasons and the results obtained have been so unsatisfactory that no work will be conducted in it in the future. The original seed imported was obtained from Mr. Coker, the President of the Coker Seed Co., of South Carolina, U.S.A., the company which is maintaining the standard of this variety. Under the eastern coastal conditions of the U.S.A. excellent results are obtained from this cotton, but when planted in Queensland only average yields have been obtained and the quality of the fibre has been inferior, being very tender and weak, with a high percentage of waste.

Delta-Type Webber.—This seed was obtained from Mr. Coker at the same time as was the Webber 49. The variety is of the general medium-sized boll, long staple type of cotton, being $1\frac{3}{16}$-$1\frac{1}{4}$ inches in length. Only study of a preliminary nature has been attempted in this variety so far, but it is anticipated that in the coming season selection work will be commenced.

This variety is grown in the U.S.A. in sections resembling our coastal areas, and being somewhat of the same general type as Durango, intensive work has been postponed during the developing and training of our staff.

Lightning Express.—This is another Coker cotton, and the results obtained so far from it, while not entirely satisfactory, indicate that further careful work is warranted. Selections of this variety were made last season, the best of which will be planted in the progeny row system in a plot in the southern area. It is anticipated that by the end of the coming season ample evidence will be at hand to determine more accurately the true merits of the variety.

In general, it is a desirable type of plant, bearing a medium-sized boll, containing a fibre averaging a good 1⅛ inches in length, strong, and of a nice body and colour. The main attractive feature claimed for the variety is earliness of maturity, which warrants further investigations being made.

Community One Variety Production.

The experiences of every other cotton-producing country have shown that it is highly desirable to limit the number of varieties to as few as possible and still meet the full requirements of all areas. The ordinary Queensland cotton, which is being replaced to a great extent this season by the Durango cotton, offers an excellent illustration of the results of growing many varieties in a district. Not only does cross-pollination take place in the fields during the flowering season, but the ginning operations as well assist in the mixing of the varieties. This has occurred to such a degree in Queensland that the ordinary seed has deteriorated to the point where the lint is of a very inferior quality, owing to the irregularity of the length of the fibres and the varying character.

The Department of Agriculture hopes, therefore, that the production of cotton in this State can be limited to one variety. It is anticipated that by developing strains for each general area of the most suitable variety for all conditions, no one district will be penalised. Under such a system every attempt will be made to keep the character of the lint as nearly alike as possible and at the same time develop the productivity of the strain to the highest point.

The production of only a uniform style of fibre over the whole of the cotton-growing areas would be of marked value to the industry as a whole, as the problems of ginning, marketing, and maintaining the purity of the variety, &c., would be greatly simplified.

QUEENSLAND'S PRODUCTS IN NEW ZEALAND.

DEPARTMENTAL DISPLAY AT THE DUNEDIN EXHIBITION—PRESS TRIBUTE.

The Acting Premier and Minister for Agriculture and Stock (Hon. W. Forgan Smith) has received an interesting report from Mr. H. W. Mobsby, the Queensland representative at the Dunedin Exhibition, on the Queensland Court and the Agricultural Department's display at the Exhibition, from which is taken the following notice from a leading New Zealand journal:—

"In the Queensland Court there is probably assembled the greatest range of primary products from any one State or country that is to be seen in the Exhibition. Queensland runs from temperate zone to tropical products on account of her size and the variety of her climate. The agricultural display of this court will be of particular interest to farmers, for there are shown in various stages of growth cereals and plant products with which New Zealand is little acquainted. Much maize is grown, and the production of this corn is illustrated by examples of it in various stages. Examples of merino and crossbred wools are on show. Tobacco, sugar, and cotton in the different stages of their evolution are interesting features. The by-products of cotton (meals, seeds, and crude and refined oils from the seed) give the person interested in its cultivation an insight into the operations of the industry. The cassava root, the subject of possibly far-reaching experiment in power alcohol production, is on view. At present starch and tapioca are obtained from the root, and these in crude and finished form are shown. Queensland hopes that she will be able to add considerably to the value of the cassava root by solving the problem of producing power alcohol in commercial quantities.

"A great variety of minerals is shown in a special exhibit, including original gold, silver, lead, and copper. A piece of silver-lead ore from the famous Mount Isa field, the discovery of which caused a sensation in Australian mining circles last year, is on view. In this section there is much to interest the geologist."

LEGISLATION REGULATING THE SALE OF SEEDS, FERTILISERS, STOCK FOODS, AND PEST DESTROYERS.

A BRIEF EXPLANATION.

By F. F. COLEMAN, Officer in Charge Seeds, Fertilisers, Pest Destroyers, and Stock Foods Investigation Branch.

Under the Acts regulating the sale of fertilisers, stock foods, and pest destroyers dealers are required to make certain returns during the month of January in each year, and for their information the following brief outline of the Acts referred to is given.

"The Fertilisers Acts of 1914 to 1916."

Every person who desires to sell fertilisers during 1926 should fill in an application for license form and enclose therewith the prescribed fee of £1 1s., sending same to the Under Secretary, Department of Agriculture and Stock, Brisbane. Licenses under the Fertilisers Acts remain in force until the thirty-first day of December of the year of issue.

On or before the thirty-first day of January in each year, every licensed dealer is required to fill in and forward to the Under Secretary, or Officer appointed for that purpose, a Certificate of Registration of Fertilisers, setting out the ingredients of each brand of fertiliser that he is selling or proposes to sell, and the percentage of nitrogen, phosphoric acid, and potash, and the forms in which these ingredients respectively occur.

In addition to the above, every producer of fertiliser is now required to forward a schedule setting out the following particulars:—

(1) The brand under which the fertiliser is known;

(2) The price per ton of the fertiliser, free on rail at Queensland works, or at Brisbane;

(3) The name and address of the manufacturer or importer of the fertiliser;

(4) The place of manufacture; and

(5) The raw materials from which the fertiliser is manufactured or prepared; and if the fertiliser contains mineral rock phosphate, Nauru phosphate, or any organic material such as leather, hoof, horn, hair, wool waste, peat, garbage, tankage, or similar material, the percentage by weight thereof, and a statement as to the treatment or process (if any) to which the organic material has been subjected.

It should be noted that a producer within the meaning of the Regulations is "Any licensed dealer who, whether as manufacturer, importer, or wholesale dealer, is primarily responsible for putting on the Queensland market any fertiliser, and in the case of a producer whose place of business is not within the State of Queensland, the agent of such producer who is resident in Queensland."

Producers of fertilisers are also required, within seven days of registration, to furnish to the Under Secretary, or other officer appointed for the purpose, a specimen of the printed label for each fertiliser registered.

"The Pest Destroyers Act of 1923."

Every wholesale dealer in pest destroyers must before selling any pest destroyer, or on or before the thirty-first day of January in each year, fill in and forward to the Department Forms 3 and 4. Every notice on Form 3 must be accompanied by a fee of 5s. for each pest destroyer mentioned therein, provided that the total sum payable by any dealer in any one year shall not exceed £1. Every notice on Form 3 must also be accompanied by a statutory declaration (Form 5). Each such statutory declaration must be accompanied by—

(1) A sample in the original package, or if usually sold in bulk in a sealed glass or earthenware jar or bottle, bearing the prescribed label, and in every case it must not be of less weight than half a pound.

(2) A specimen copy of the prescribed label and directions for use.

(3) A specimen copy of the invoice given to a buyer under section 5 of the Act.

A wholesale dealer in pest destroyers is any person who, whether as manufacturer, importer, or wholesale seller is primarily responsible for putting the article on the Queensland market. If the manufacturer or wholesale merchant is not resident within the State of Queensland, the requirements of the Act may be complied with by a duly authorised agent who is resident in Queensland; such agent for the purposes of the Act is deemed to be the wholesale dealer.

Retail Sellers of Pest Destroyers.

Every retail seller of pest destroyers is required each year, on or before the thirty-first day of January, to fill in and forward to the Department of Agriculture, Brisbane, Schedules 1 and 2—printed on blue paper.

It is well to note that the term pest destroyer includes such articles as:—

Arsenate of lead, arsenic, cattle dips, copper soda, copper carbonate, copper sulphate, cyanide of sodium, cyanide of calcium, formalin or formol, iron sulphate, lime sulphur, nicotine, nicotine compounds, phenolic insecticides, germicides and disinfectants, phosphorous pest destroyers, prickly-pear poisons, arsenical weed destroyers, insecticides, red oil preparations, sheep dips, strychnine, sulphur, tobacco dust, tobacco powder, and any insecticide, fungicide, vermin destroyer, or weed destroyer.

The particular attention of retail dealers is directed to the labelling of each package of pest destroyer. The label on each package received by them from the wholesale dealer should state:—

1. The distinctive name of the pest destroyer.

2. The net weight contained in the package or, in the case of liquids, the true volume content expressed in Imperial gallons or fractional parts thereof.

3. The names of the active constitutents, and when so required by the prescribed standards, the percentage of such active constituents and (or) the impurities contained therein.

4. All directions for use of the pest destroyer.

5. The name and address of the Queensland wholesale dealer.

Every dealer must, on the sale of any pest destroyer of a greater value than five shillings, on or before delivery of such pest destroyer, give to the buyer an invoice setting forth:—

1. The name and address of the dealer.

2. The net weight or Imperial measure and name of the pest destroyer.

3. A warranty in the following words:—Nothwithstanding any agreement to the contrary, this invoice shall be deemed to be and shall have effect as a warranty by me, the seller, that the constituents of the pest destroyer sold, and the percentage in which each constituent is contained therein and the percentage of each constituent contained in that part thereof which is soluble in cold water, accurately corresponds with the constitutents and percentages respectively stated in the statutory declaration furnished to the Under Secretary, Department of Agriculture and Stock, Brisbane, as prescribed with respect to the pest destroyer of the same name by "*The Pest Destroyers Act of* 1923."

The Act provides that no purchaser is bound to accept delivery of any pest destroyer unless it is labelled and invoiced in accordance with the above; further, the buyer is not bound to take delivery of any package of pest destroyer which upon weighing does not correspond with the weight as set out on the label and invoice.

"The Stock Foods Act of 1919."

Under the Stock Foods Act every wholesale seller, that is to say every manufacturer, importer, or other person primarily responsible for putting on the Queensland market any mixed, concentrated, or prepared stock food, must, on or before the thirty-first day of January in each year, send to the Department of Agriculture a fair average sample of each mixed, concentrated, or prepared stock food or prescribed by-products.

(1) Each sample must be in a sealed glass jar or bottle bearing a label, with the distinguishing name or trade mark of the Stock Food, and containing at least two pounds in weight:

(2) Be accompanied by a statutory declaration made in a personal capacity on the prescribed form, stating that the sample is a fair average sample of the Stock Food it represents, and is not substantially different from the Stock Food which such seller and his agents will supply throughout the year, under such distinguishing name or trade mark, and stating the specific name and proportion or amount of each of the original grains, or seeds, or materials, or ingredients:

(3) Be accompanied by a specimen copy of the Invoice relating to such food, on which the Vendor must cause to be legibly printed the word "Invoice." All Invoices given to a buyer under Section 6 of the Act must state specifically the materials of which the food consists, also the number of packages and the gross weight of the Stock Food included in the sale:

(4) Be accompanied by a specimen of the printed label, affixed to every package, which label must clearly certify:—

The number of net pounds in the package.

The distinguishing name or trade mark of the Stock Food.

The name and principal address of the wholesale seller.

The chemical analysis of the Stock Food expressed in the following terms:—

Minimum percentage of crude protein,

Minimum percentage of crude fat,

Maximum percentage of crude fibre.

The specific name of each of the original grains, or seeds, or materials, or ingredients, and the specific name and proportion or amount of the foreign ingredients, if any.

(5) Be accompanied by a specimen copy of all directions, if any, for the use of such food.

Section 3 of the Act applies to the following Stock Foods and to foods of like nature, all of which require to be labelled:—Bran, pollard, linseed meals, cocoanut oil cake or meal, cotton seed cake or meal, by-products of barley, maize, and rice, maize gluten meal or feed, dried skim milk, calf meals or calf foods, poultry foods and mashes, condimental stock foods, lucerne meal, molasses feeds or meals, fish oils and meals, dried brewers' or distillers' grains, malt sprouts, blood and meat meals, digester tankage, maize-germ meal, dried butter-milk, horse, cattle, and pig foods, chick feeds, any mixture of meals, and maize and cob meal.

Meals made directly from the entire grain or seed of:—Barley, buckwheat, broom corn, beans, cotton, cowpeas, linseed, maize, *mixed bird seeds, millet, oats, peas, rape, rice, rye, sorghum, wheat, and *mixed poultry corn.

Every seller should make himself fully acquainted with the Regulations now in force, and before making out statutory declarations on the prescribed forms, or having the necessary labels printed, it is advisable to ascertain if the proportions are correct, and in accordance with the materials now used. The minimum amount of crude protein and crude fat, also the maximum amount of crude fibre, declared on the labels should be based on a recent chemical analysis of the actual food now being offered for sale.

Every seller of stock foods is required to keep a copy of the Regulations constantly affixed in or on some conspicuous place in every shop, shed, or warehouse where he or any employee cuts, sells, or distributes chaff or any stock food.

"The Pure Seeds Acts of 1913-1914."

A vendor under these Acts is any person who sells or offers or exposes for sale or contracts or agrees to sell or deliver any seeds.

The Acts require that on the sale of any such seed of not less than 1s. in value, the vendor shall at the time of the sale give to the buyer, or, if the buyer is not present at the time of sale, forward to him an invoice containing the statements required by the Acts.

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*With mixed bird seed or mixed poultry corn composed solely of whole grain or seeds, the chemical analysis need not appear on the labels, the specific names of the different ingredients, with proportion or amount of any foreign ingredients, complies with the Act.

"The wording of the invoice should be to the following effect:—

> "The kind or kinds of seeds mentioned on this invoice are for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed for such seeds."

In the case of seeds in pictorial or other made-up packets, such packets must be clearly and indelibly marked upon the outside with the year in which the seeds were grown.

The amount of foreign ingredients allowed in the various kinds of seeds are set out in the Regulations, a copy of which can be obtained on application to the Department of Agriculture, Brisbane.

Although buyers and sellers are able to form a good idea of the market value or price, experience shows that they are frequently misled as regards purity and germination of the seeds that they have purchased and are offering for resale.

The Regulations further provide for the examination of samples at the Seed Laboratory, Brisbane, the cost being the nominal one of 2s. 6d. for each Certificate of Analysis. When sending such samples it is of the utmost importance that they be drawn by the sender from seeds in his actual possession, care being taken to make them truly representative of the bulk. The weight of each sample and marking required are fully explained in the Regulations. In case of any complaint regarding purity or germination, the vendor should at once send a sample of the seed together with the name and address of the person from whom the goods were purchased together with a covering letter to the Department advising of the despatch of the sample.

Unless the sender is careful to forward a truly representative sample the certificate is valueless. Under no circumstances is it a guarantee by the Department of Agriculture as to the bulk, but an analysis of the sample received, giving a plain statement of its condition at the time when such analysis was made.

PRESCRIBED WEIGHT OF SAMPLES.

Kind of Seed.	Weight Required.
Barley, Beans, Cowpeas, Maize, Oats, Peas, Rice, Rye, Tares, Wheat ..	8 oz.
Canary, French Millet, Japanese Millet, Linseed, Lucerne, Prairie Grass, *Setaria italica* (Foxtail Millet), *Sorghum Sudanense* (Sudan Grass), Sorghum, White Panicum	4 oz.
Couch, Paspalum, Rhodes	2 oz.
Beet, Cabbage, Carrot, Onion, Parsnip, Radish, Tomato, Turnip, and Vegetable seeds of like size	½ oz.
Vegetable seeds in made-up packets	3 packets
Agricultural and Vegetable seeds other than those included above ..	2 oz.

All samples must be plainly written on in ink giving the following particulars:—

(1) Kind of seed.

(2) Quantity the sample represents.

(3) Marks on bags or growers name.

(4) Name and address of sender.

Each sample, with a covering letter enclosing the prescribed fee of 2s. 6d., should be addressed to the Under Secretary, Department of Agriculture, Brisbane.

For the purpose of ascertaining if the legislation regulating the sale of Seeds, Fertilisers, Pest Destroyers and Stock Foods is being complied with, Officers of the Investigation Branch inspect and take samples of the various stocks held by dealers in all parts of the State. Details of this work appears in the Department's Annual Report, and for the information of both buyers and sellers a reprint of that portion of the Report dealing with these matters is available for distribution.

It cannot be too widely known that the Seed Laboratory examines free of charge all samples representing seeds that farmers have purchased for their own sowing. Both buyers and sellers are urged to examine all goods on the day of delivery, and when in doubt regarding any seeds, fertilisers, pest destroyers or stock foods to write at once to the Department of Agriculture, Brisbane, in order that the matter may be at once investigated.

Photo.: G. B. Brooks.]
PLATE 4.—A FINE CROP OF DWARF KAFFIR, GROWN BY MR. T. SEICRUP, SCRUBBY CREEK, GRACEMERE, CENTRAL DISTRICT.

(*Continued from page 6.*)

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (23rd December, 1925), from Mr. W. Cottrell-Dormer, who is investigating diseases and pests of sugar-cane.

The last few weeks of the year are proving a most unsatisfactory period in which to make observations of the kind attempted, since the leaf streaks diagnostic of some of our most important diseases and of the greatest value in disease detection, either do not show up or are obliterated by drought effects.

Tully.

Diseases.—Allowing for the inauspicious weather conditions, which, as I have already stated, have made it almost impossible for me to detect certain diseases in their early stages, the cane in this district appears to be on the whole rather healthy and disease free. However, Leaf Scald is present and deserves interest on the part of the farmers, while a fairly common scrubland disease, which I shall describe further on, was observed on one farm.

Leaf Scald.—Leaf Scald was found doing quite considerable damage to some late cut and slightly grub affected Badila (N.G. 15) on one farm, about 2 miles north of Banyan, though cane grown from the same plants but not cut late and unaffected by grubs is but slightly infected on the same farm. The disease was found on a neighbouring farm on my visit to this district last year. At Euramo, on the south bank of the Tully River, the disease was found to be doing very slight damage to otherwise healthy Badila, and serious damage to one or two small fields of Clark's Seedling. The soil in this locality is rather good, so that, unless the infected cane is cut very late and the ensuing ratoons used for plants, the disease should not do any serious damage. At El Arish several slightly infected fields of Badila were encountered; and Clark's Seedling and Green Goru were found to be very badly infected on two farms.

Brown Rot.—I have mentioned in certain of my reports the finding of an acute cane disease which, in my notes, I have for convenience referred to as St. Helen's disease, as it was first observed by myself at St. Helens; however, this is not really a suitable name, especially as this disease is probably fairly widely distributed, so I propose that the name "Brown Rot" be applied as being easier to memorise and more or less descriptive.

Description.—A stool of cane severely affected by Brown Rot is very similar in appearance to one which is being vigorously attacked by grubs—*i.e.*, its leaves are badly wilted or even quite dead and dry although they are fairly normal in size. A strong pull at the stool shows, however, that grub damage is not the cause of the trouble, as the stool is quite firmly rooted in the soil.

If, in the case of young cane (*i.e.*, erect cane whose "top" is touching, or in proximity to, the soil) the leaf-sheaths be examined, it is found that the outer ones are quite disintegrated at the portion which should join the cane stem, and are cemented together at their base by a thick stroma or layer of fungus mycelium. This stroma is of a strong felt-like consistency and surrounds the cane stem in the vicinity of these leaf-sheath bases. The stroma would seem to vary in colour according to its age, that found on the outer leaf-sheaths and on the more or less developed portions of the cane stem nearby is of a rich dark brown, while on the inner leaf-sheath bases it is white, intermediate colours being found as one approaches the older leaf-sheaths.

Buds, root eyes, and adventitious roots in this region and below it are quite dead soft, and more or less dry, while the stem at this region is also dead. If the dead portion of the stem be now sliced transversely at an internode it is found that the whole of the parenchymatous (*i.e.*, fleshy) tissues are of a pale russet-brown colour, while the vascular bundles, or fibres, are of a similar colour, but a good deal darker. To the touch these dead tissues are dry and have the feeling of tough polyporous pith. In the case of tall cane this dead portion is found near the soil surface. On slicing the stem longitudinally it is found, where the stem is not entirely killed, that this dead tissue is separated from tissue of a normal appearance by a narrow region, say, $\frac{1}{2}$-in. in depth, which is of a very dark brown, almost black, colour.

When the stool is dug out it is seen that the roots are all dead and in many cases invested in a soft felt-like layer of light brown to saffron-coloured mycelium. No thick white mycelial strands occur.

Sufficient information not being available the early symptoms of the disease cannot be described, but the above description will suffice to acquaint farmers with it, and reports from the latter relating to its occurrence would be very welcome.

Distribution.—The disease has been found on one farm in each of the following localities during the past fourteen months:—Upper Mowbray River, near Mossman, in plant Badila; Upper Sawmill Pocket, near Gordonvale, in plant Badila; Euramo, Tully River, in plant Badila; Kolijo (St. Helens), near Mackay, in plant Badila; and at Mount Pelion, near Mackay, in first ratoon D. 1135.

The above list gives the impression that Badila is the most susceptible variety, but this is not necessarily so as the disease has been found in every case on ''new'' cane-holed scrub soil, where Badila is almost invariably planted in the North.

Damage Done.—In the outbreaks recorded to date the disease has only been responsible for the death of patches of cane in the infected fields. All infected stools appear to eventually succumb, as no case of mere stunting was observed. Surrounding cane was always in perfect health and soil in good mechanical order, though containing a large quantity of decaying timber.

Insect Pests.

Serious damage was being caused on one farm at Euramo by a small pale-brown field ant measuring about $\frac{1}{8}$ in. This ant, which I have not yet succeeded in identifying, is a most persistent mound builder—it will build a mound of loose earth as big as an ordinary hand basin in the course of one night, and if this mound be broken down during the day, another will be found to have taken its place on the following morning. It is in this way, to a large extent, that it does its damage, as it builds these mounds around the growing shoots of young cane, thus preventing the latter from stooling. On digging the soil beneath these mounds interminable tunnels are found, which lead to large nurseries and pupal chambers where the young ants are reared and, perhaps, initiated into the mysteries of ant-craft. It seems probable that the colony's food supplies are largely drawn from the tender and more succulent parts of the young cane roots, as these were found to be very much pitted and often devoid of hairs. The natural habitat of this insect, in this district at least, appears to be in fields of bladey grass (*Imperata arundinacea* Cyr.), in which situations it quite commonly undermines the soil to such an extent as to make it unsafe to cross the field on horseback; needless to say the grass does not prosper under these conditions. The affected portion of the farm under discussion was a field of young first ratoon Badila, and a very large area of it had, owing to the activities of the ants, failed to produce any crop at all. Meanwhile, the ants are moving out of this unproductive region and extending their operations to fresh cane. Previous to planting the field had been an old banana block and was growing nought but bladey grass. The field adjoining it is still in this condition, and is similarly very severely infested by the ant.

Control.—Sugary poison baits having failed to produce any effect, fumigation of the soil with a mixture of paradichlor. and carbon bisulphide (as successfully used by Mr. H. Freeman against the white grub at Greenhills) was recommended.

Other Insects Observed.—*Lepidiota caudata* and *Anoplognathus punctulatus* (kindly identified by Mr. A. Burns, Acting Entomologist at Meringa), were on the wing at the time of my visit, as were also *Repsimus æneus, Lepidoderma albohirtum,* and *Anoplognathus boisduvali.*

So far grubs have done but little damage in the Tully River district. Army worms and moth borers are slightly prevalent.

Herbert River.

During the three weeks spent in this district fifty-four farms were visited in the following localities:—Stone River, Long Pocket, Hawkins Creek, Trebonne, Fairford, Ingham, Ripple Creek, Seymour, Macknade, Halifax, Cordelia, Victoria, Toobanna, Francis Creek, and Waterview.

Gumming Disease.—Gumming disease is undoubtedly causing far less damage now than it was some two or three years ago, this being mainly due to the discarding of the very susceptible variety Clark's Seedling. However, a few fields of badly gummed cane remain, especially at Toobanna (where Clark's Seedling is still being

planted in spite of the experience of the Victoria and Macknade growers), the Halifax, Nelson's Creek, near Macknade, and Victoria. According to the observations of the Colonial Sugar Refining Company's Disease Staff Q. 813 is showing great resistance to gumming disease, this variety is therefore being planted very widely this year.

Increased attention to drainage on the part of farmers is a noticeable feature of the campaign against gum in the Herbert River district.

Other Diseases.—Early symptoms of Top Rot were seen in two fields at Macknade on which the plant crop suffered rather severely. Red Rot was found causing severe damage in one field of Green Goru, on the Upper Stone River, and in one field of Clark's Seedling at Long Pocket. Foot Rot is doing slight damage on many farms.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By A. N. BURNS, Acting Entomologist.

Grey-back cane beetles (*Lepidoderma albohirtum* Waterh.) are still emerging in moderate numbers, and females are engaged in oviposition. Should soaking rains fall within the next week or two, a larger and probably final emergence of these insects should occur. Hand collecting of beetles from feeding trees—Figs (*Ficus* sp.), Paper Bark (*Melaleuca leucadendron*), and Moreton Bay Ash (*Eucalyptus tesselaris*)—is to be recommended from examples of any of these trees growing adjacent to cane fields, and in places where flights of beetles are nightly observed.

Keep soil well worked and open, for clean cane fields are much less attractive to egg-laden female beetles than weedy ones, and loose open soil proves a hindrance to them when burrowing in to oviposit. In working soil as close to plants as possible, many young first-stage grubs of the "grey-back" will be unearthed during cultural operations whilst they are feeding on roots close to the surface; this will give the cane plants a better chance to build up a strong root system to withstand later attack from second and third stage grubs of the same pest, and will destroy a good many of the young grubs.

Canefields in which grubs of the "frenchi" cane beetle (*Lepidiota frenchi* Blackb.) are active, will now be beginning to show the effects of its depredations, though probably only in patches here and there. Whilst the weather is still dry and the soil not too moist, fumigation where necessary with paradichlor. or other fumigant should be carried out. As these grubs are more local than those of the grey-back, areas which are known to be affected year after year should be watched and the cane fumigated before the grubs have done too much damage to the root systems of the stools to effect a profitable recovery. Frenchi beetles will very probably emerge in large numbers after the next rains; odd specimens have already been observed, the first being noted in flight at Meringa on 20th December.

Farmers who have cane lands—either plant cane or ratoons—that are troubled every year with grey-back beetle grubs are requested to please communicate with the entomologist at Meringa Laboratory, so that field experiments to test the values of various fumigants may be carried out during the next month or two whilst the grubs are active.

Growers having cane badly infested with the bettle borer (*Rhabdocnemis obscurus* Boisd.) are requested to get in touch with Meringa Laboratory for the purpose of obtaining Tachinid fly parasites to combat this pest. Where there is standover cane infested with borers, conditions are very suitable for the establishment of these flies, there being a supply of borer larvæ to tide the flies over till the young plant crop and ratoons make cane, some of which will doubtless become borer infested.

These flies unfortunately received a check in the breeding insectaries owing to the presence of an entomogenous fungus which destroyed numbers. It is expected, however, that further supplies of these "useful parasites" will very soon be available for liberation. Liberations are effected free of cost to growers, on condition that they are prepared to leave at least a quarter of an acre of borer infested cane as standover in order to give the flies a chance of establishing themselves.

FIELD REPORTS.

Mr. E. H. Osborn, Central Field Assistant, reports (22nd December, 1925):—

Proserpine.

During a short visit to Silver Creek several paddocks of new land were noticed under crop, amounting to 50 acres in one instance and 22 acres in another. The canes M. 1900, Q. 813, and H.Q. 426 had made an excellent strike, and should develop into good crops. Nearby, a 6-acre plot of first ratoon H.Q. 426, and a 2-acre piece of first ratoon M. 1900 showed careful cultivation.

In the Conway area, both the pasturage and cane looked surprisingly green; probably more rain had been registered here than in other parts of the Proserpine area, and the young plant as well as recently cut ratoons compared more than favourably with cane seen elsewhere.

Several soil samples were taken here, and much interest is being taken in the work of the Experiment Station.

Disease.—Leaf Scald was noticed in N.G. 24B in ratoons at Cannon Valley, and also near the town area, whilst Red Rot in H.Q. 426 was seen in several places to a slight degree. As regards Leaf Scald, its dangers have been so fully described in the November 1924 issue of the "Sugar Journal" that it should need no further comment.

Cultivation has improved very much in this district within the past few years, labour-saving devices being given a fair trial, and any implement that promises well finding a ready sale.

Green Crops.—Several good crops of cowpea were noticed, but there is yet room for a much further acreage being put under. Liming should also be of great benefit to the heavy type of soil found in parts of the area.

Cane Varieties.—M. 1900 and Q. 813 are still giving great satisfaction, whilst H.Q. 426, although a favourite in many parts, is not so in other localities. Probably the use of only the very best and healthiest plants of this useful variety will again restore its popularity. Respecting E.K. 28, Quod Brothers were so satisfied with the results obtained from a few lines of this cane that they have a further 10 acres planted up.

Bowen.

Diseases.—A couple of paddocks of B. 208 were noticed to be suffering from Leaf Stripe (Downy Mildew) when last this area was visited. Upon inquiry it was learnt that good results both in tonnage and density were obtained from the cane, but the resultant ratoons are now full of stripe, and want ploughing out.

Lower Burdekin.

Very unfavourable weather conditions were being experienced in this district, for only 24.76 inches of rain had been registered at Ayr up to 10th December, and of this 20.61 inches were registered in January, February, and March, leaving only 4.15 inches for the remainder of the period. What with dry weather, necessitating continual expensive irrigating, reduction in price of sugar, shortened working hours, delay in harvesting caused by railway and shipping strikes, the life of the usually optimistic Burdekin canegrower has been a very strenuous one.

Harvesting the large local crops is also a problem. Pioneer and Kalamia expect to have about 80 per cent. of their crop off by Christmas; but, unfortunately, Inkerman will only have some 50 per cent. of their huge tonnage crushed by that time.

The worst feature of the standover cane is that a large proportion of such is now very heavy cane, and what sort of a return the grower is likely to receive from it next year is problematical.

Varieties.—Despite such conditions, some remarkably good crops of cane have been, and are still being harvested. B. 208 has once again given some extraordinary high density returns, no less than five samples of this cane analysing from 20.0 c.c.s. to 20.5 c.c.s. at Kalamia.

Green Goru (24 B.)—Has not been as satisfactory this year as usual in many cases. Dry weather has played havoc with its results, and for a standover crop it would be very poor indeed.

The Northern Field Assistant, Mr. A. P. Gibson reports (21st December, 1925):—

INNISFAIL AND TULLY.

A Rich District.

The wonderfully rich sugar-producing district of Innisfail commences some 4 miles back from the sea and is adjacent to the Johnstone River with its many tributaries. The soil is of two distinct types and compositions, namely: (1) Fertile alluvial deposits, often shallowing as it recedes from the river; and (2) undulating to hilly volcanic scrub red soil, possessing here and there outcrops of basaltic rock. The many unproductive depressions noticed (more so in the Goondi alluvial deposits) grow prolific crops of panicum and other grasses; these are ideal spots for harbouring rats. This pest, however, is being kept well under control by systematic poisoning and clean farm surroundings.

Weather.—Very hot days and moderately cool nights with a few refreshing showers at intervals have been experienced, and such conditions have enabled harvesting and the necessary cultural operation to be continued without interruption. In this great basin of the Johnstone, frosts and prolonged droughts are practically unknown, and it is therefore rather difficult to realise the full value of rain and its influences on the producing effects of the crops.

Cane Culture has made remarkable progress since the year 1881 when its founder, T. H. Fitzgerald, first erected a mill and manufactured some 40 tons of sugar from 129,125 gallons of juice. The remains of the old factory may yet be seen on what is known as the Innisfail Estate. To-day there are three big mills—Goondi, Mourilyan, and South Johnstone, and the estimated tonnage to be crushed is 550,000 tons.

Crushing.—Goondi and South Johnstone mills commenced crushing early in the year and have made good progress. The former is through with its crop of about 170,000 tons, and the latter may carry on until the end of January; the final date of crushing depends entirely on the weather and what relief the new Tully mill can give. Mourilyan is handling a record crop, and owing to early machinery mishaps had not crushed as great a tonnage as desired. Some 105,000 tons had been crushed, and the management is hoping to treat about 140,000 tons before the season ends. Should this be realised some 30,000 tons must stand over. Their hopes may be shattered by early continuous rains making the fields unfit for speedy crop removal and reducing the c.c.s. to such a degree that further crushing would be unprofitable. South Johnstone mill is rather handicapped, being situated on its northern boundary and separated from its main supply by some broken country through which a heavy and well-constructed line with its many branches pass. This lengthy and somewhat heavy haulage on a single track sometimes causes delays. The mill is now working 44 hours a week, and it is expected that 212,000 tons will be crushed. The cane being received at these mills is as clean as can be expected. A great quantity of sugar yet remains in store. The c.c.s. has been very good, but is now fluctuating and, on the whole, declining in quality.

Harvesting.—The weather, although hot, has been suitable for harvesting operations, and the conditions described, coupled with good and abundant labour, has enabled satisfactory progress to be made. Pests have been responsible for higher harvesting rates, and an increased number of burning permits. Several paddocks of N.G. 15 (Badila) at South Johnstone were so badly damaged by grubs and borers that they were left uncut. After the fire had passed through the area many of the remaining stems were examined; the beetle and its larvæ were located, but they were all dead.

Fires.—Great areas of cane have been burned, more especially in the Mourilyan and South Johnstone areas. Many fires are unpermitted and often result in great loss to the unfortunate owner.

Transportation.—The district crop is entirely removed by a wonderful network of tram lines, connected with portable lines which bring forward the loaded cane cars from the several paddocks. The railway system and its rolling-stock are important units, but, as a rule, do not receive the same careful consideration and attention as do other lesser ones, resulting in lengthy delays in field and mill, and great truck destruction. Some of the South Johnstone farmers have the difficulty of surmounting and descending steep grades with their loaded cane trucks. This takes a bit of manœuvring and adds to production costs.

Ploughing.—Most of the ploughing is carried out by the disc plough drawn by animal or motor power. A red-soil farmer was endeavouring to plough in a crop of N.G. 15 (Badila) having some 3 or 4 ft. of stem; the resulting work was only fair. The soil was dry and friable and did not offer much resistance to the disc, therefore the action was rather a rolling instead of a cutting one.

Planting.—Little planting was in progress. Farmers often plough out the exhausted stubble and replant as soon as possible. This is not a practice to be recommended, but when performed the grower should satisfy himself that the land has been thoroughly prepared before planting, in preference to planting and hoping to improve its condition later. The drills of newly-planted cane are often filled in with soil too quickly. The mother plant is the storehouse of food for the infant roots and shoots, and should the primary stool be delayed in reaching daylight (by over-much soil covering) and prevented from providing food for its future nourishment from the surrounding air and soil, it often becomes exhausted and dies.

Cultivation.—Great activity prevailed on the farms, implements of all kinds were in use loosening up the soil between cane rows and same time freeing same of weeds. Subsoilers are favoured. These, as a rule, do good work, but sever the newly developed root system which, as previously stated, must temporarily retard crop growth and may permit the ingress to plant of fungi and other pests.

Ratooning or Off-barring.—The object of this is to loosen the soil in order that lighter implements later may work. It is important to do this preferably immediately after burning off before many shoots are formed, and it is recommended to follow off-barring by light cultivation, thereby returning the loosened soil back against the stool. As a rule dry area farming is somewhat different to a wet one; in the former the fields should be kept practically level, thereby exposing the least surface to winds and sun. In the wet the cane is left in ridges, the depressions between help drain off the excess water and permit some of the roots to dry, in long continued periods of wetness. The main object of the grower should be to see that his cane crops get a good start in life; it will then itself eventually control the weeds.

Pests and Diseases.—Grubs, rats, and the beetle borer (*Rhabdocnemis obscurus*) are the most common and more destructive pests found here. The former had done much damage to cane growing on the volcanic porous red soils. Rats have injured crops bordering unclean headlands and depressions. The borer apparently is very well established in the South Johnstone mill area; the increase may be attributed to the great quantity of recumbent and decaying unpermitted cane remaining in this area. It is recommended to liberate freely the Tachinid fly. This fly is doing good work in the Goondi area at present. Many grey-back beetles were being captured from the feeding trees in a river side scrub adjacent to Daradgee ferry. Leaf-eating insects, caterpillars, aphis, sacchari, and sooty fungus were noticed. Leaf Scald was rather bad in places. This is a serious disease, and can be reduced if the growers will only exercise more care in plant selection. South Johnstone Sugar Experiment Station was visited. It is prettily nestled at the foot of Mount Basilisk, and for the greater part possessing very level fertile alluvial deposits, but rather inconveniently separated from the mill by the South Johnstone River. Many experiments were in progress and the raising of the seedlings was found interesting. This entails much patient work.

Improvements.—Roads here are bad. A stonebreaker is at work now, and a good sort of broken metal is being placed on some of the roads. Two reinforced concrete hotels are being constructed and when completed will, it is hoped, help to reduce the worries of those seeking accommodation. A very fine concrete bridge is being placed over the South Johnstone River, near the mill. This will span what can be a very nasty crossing.

Manuring.—Growers here realise the importance of maintaining the fertility of the soil. This is necessary, more so in localities where rains are sometimes heavy and continuous. This has an injurious effect on the soil, chiefly perhaps, by leaching out the nitrate, one of the most valuable of plant foods. The cover crop mostly planted and favoured is Mauritius bean; cowpea and corn are also planted together, the corn acting as a support. B 3, Howe's mixture, and sulphate of ammonia are applied to the farm at various rates and with beneficial results.

Varieties.—The principal variety raised is N.G. 15 (Badila); a little H.Q. 426 (Clark's Seedling) and 7 R 428 (Pompey) is also raised. H.Q. 426 is now a condemned variety at Goondi, and the latter mentioned grown only by permission, on

approved land. N.G. 15 (Badila) is a low-fibred cane, and in consequence is preferred by rats and borers. We must strive to secure a deeper rooting variety and one possessing a tougher skin and yet possessing the sugar and growing qualities of the N.G. 15.

Bananas are being grown in these parts. The past has proved they will do well; the future must decide if they can be profitably grown under existing conditions.

The plant and ratoons are growing vigorously and look remarkably healthy, but urgently require rain. The husbandry on the whole was found satisfactory, and the present prospects are again bright for 1926. It is evident that much cane will be left to stand over; the actual tonnage left of course depends on how long the mills can profitably work.

Tully.

Tully is the home of Australia's newest and most modern sugar-mill. Surrounding it is an extraordinarily fast growing little town. It is some 35 miles distant by rail from Innisfail, and is conveniently sandwiched between Mount Tyson and the Banyan Creek. To realise the importance of our great sugar industry it is necessary for one to see the busy sugar fields and a modern factory at work. Most of the machinery in the mill was made in Queensland. It commenced crushing on the 9th November. There have been delays, which, as a rule, are expected in a maiden run. The allotted weekly cane tonnage had not been fully crushed, therefore a huge stock of burnt cane was on hand, some of which was in a fermented condition. The greatest weekly tonnage treated to date (12th December) was 3,500 tons—15,000 tons had passed through the rollers. The local crop is estimated at 13,000 tons. The management expects to extend crushing until the end of January, when over 30,000 tons will probably have been crushed. Relieving South Johnstone of this amount will considerably help all concerned. The refuse from the mill is badly polluting the lower waters of the Banyan and Tully River. This must inconvenience the settlers concerned. Many and varied are the reports in circulation regarding the quality and future of the Tully lands. Scrub is being felled and the land being prepared for cane—the whole operation including scrub brushing and falling, logging, holing, and plants. The variety N.G. 15 (Badila) is mostly grown. Some heavy crops were being harvested and some good plant strikes were noted. The crop on the whole, at present, is rather poor and urgently requires rain. Farmers should be careful in securing seed free from pests and diseases, more especially in a new district. Leaf Scald was noted; also a few grubs.

Plate 5.—Yarded at Last. Sheep Mustered in the Yanburra Woolshed Yards, Bexley Station.

PLATE 6.—EWES AND LAMBS MUSTERED FOR LAMB-MARKING, YANBURRA YARDS, BEXLEY STATION, MR. E. G. BLUME'S PROPERTY, NEAR LONGREACH.

PLATE 7.—THE WOOLLY WEALTH OF WESTERN PASTURES.
Ewes and lambs yarded at Yanburra House, Bexley Station, in the Central West.

COTTON STAINERS.

By E. BALLARD, B.A., F.E.S., Commonwealth Cotton Entomologist.*

The so-called "Cotton Stainers" are to be found in most cotton-growing countries and are of first importance among the many pests which prey upon the cotton plant.

The damage which they do is often attributed to weather and other causes and cotton-growers do not realise how the stainers are lowering the value of their crop.

Stainers belong to the order Hemiptera, which includes all the bugs, scale insects, mealy bugs, cicadas, &c.

They vary from just under to rather over ½ inch in length. All are very similarly coloured, being greyish-brown to orange on their heads and forewings and barred with black and white on the under side. On the forewings is generally either a dark spot or a bar. There is a number of species and all belong to the genus Dysdercus. The main points of their life histories are similar. Eggs are laid in the ground or under the débris of leaves generally lying in a cotton field. These eggs are yellowish objects easily seen with the naked eye, and are laid in masses and so are readily visible. From them hatch out small red or orange-red nymphs, very similar in shape to the parent bugs but without wings.

They find their way up to the open cotton bolls and feed on the seeds by thrusting the needle-like stylets of the proboscis through the outer seed coat. The main food of these bugs is the seed of cotton or of plants related to cotton. To return to the just hatched nymphs—as time goes on they cast their skins and grow bigger after each moult, getting more and more like their parents. The wings begin to show as dark pads, and finally after the last moult (fifth) they become adult. The adult bugs, males and females, coupled together soon become a familiar sight to the cotton-growers.

As a rule, no stainers are to be found in the field until the first bolls open. The invasion increases as more and more bolls mature. Generally the bugs confine their attention to the seeds in the open or just opening bolls, but they feed on green bolls as well, striving to get at the seeds inside; it is this which causes so much damage to the crop. As has already been stated the stainer sucks and cannot bite. The apparatus by which it feeds consists of a jointed sheath (rostrum) holding four needle-like structures, two of which form a groove in which lie the other two. These are also grooved and form two tubes, up one of which the food is drawn. At the end furthest from the head these stylets, as they are called, have sawlike teeth. The jointed sheath simply serves as a guide, and is not thrust into the seed or boll. The four stylets alone are pushed in, and through the minute channel which they form when

* In a Bulletin issued by the Department of Home and Territories.

lying together the food is sucked up. When not feeding the stylets lie in their sheath, the proboscis or rostrum, and are carried folded under the body.

When the stylets are withdrawn a wound is naturally left in the boll wall. Before this can heal fungus spores and bacteria enter, or are carried in on the stylets. These fungi feed on the developing lint, and, where a seed has been pierced, feed also on the developing embryo.

The lint becomes weak and stained, and when it comes to be marketed is always severely penalised on that account. Attacked seeds, whether in the open or in the green boll, often fail to germinate and become infected with fungi and bacteria. In a general way the first opened bolls escape from stain, but once the stainers are in the field numbers of the green bolls are pierced, and when they open the lint is seen to be stained a dirty brown or black.

On any heap of newly-picked seed cotton lying in a store numbers of stainers will be seen feeding on any seed which may be exposed. It is the cotton seed which exerts such an attraction on them. It is therefore worth while trying the effect of putting heaps of seed in a cotton field with a view to attracting the stainers to them and away from the cotton bolls. These should be visited at frequent intervals, and the bugs collected and then destroyed. Frequent visits are a necessity for otherwise these seed heaps will serve simply as breeding grounds. Hibiscus bushes in the vicinity of cotton fields should be destroyed as far as is practicable.

Besides wild species of Hibiscus, Dysdercus will be found on the cultivated species, *H. cannabinus*, and *H. sabdariffa*, as well as on Sida spp. and Eriodendron and Bombax trees (Kapok).

There are other bugs which have the same effect on green bolls as have the stainers. Amongst the chief of these is the large yellow or yellow and orange coloured Harlequin bug. (At certain times of the year these bugs produce individuals with varying amounts of blue and red.)

The Harlequin bug (*Tectacoris lineola*) is a large shield-shaped bug nearly 1 inch in length. It comes into the cotton field under Queensland conditions very early or before flowers are open, and lays its eggs in clusters round leaf stalks. It feeds on squares and green bolls, having the same effect on the latter as the "stainers." This insect has not yet become a pest in Papua or New Guinea, but it is evidently acquiring a taste for cotton, and should on that account be watched. It is easily controlled by hand picking, as it is lethargic in its habits, and does not fly about much. The young bugs, too, tend to collect in great clusters and can easily be seen and destroyed.

The stainers and Harlequin bugs are very serious pests, all the more so in that the damage they do often passes unnoticed. In a climate with

a high humidity, as is the case even in the dry belts of Papua and New Guinea, fungous diseases must play a large part. For that reason stainers are probably more to be dreaded than boll worms.

Traps, and above all clean cultivation, and a dead season of at least two months between one crop and another, will go far towards keeping these pests under reasonable control.

EXPLANATION OF PLATE.

(The upper figure shows an adult.)

Dysdercus cingulatus, magnified four times, the lower one is a profile view of the head, the four-jointed rostrum, and the stylets. In the figure these stylets look like a single organ. There are actually four closely applied to one another, forming a tube.

Dysdercus sidæ is similar in appearance and habits to *D. cingulatus*, but the large black spots on the wings are much reduced to a small dot on each wing or they may be absent.

HINTS ABOUT BEES.

BY RUPERT HOLMES, Instructor in Poultry Raising and Beekeeping, Queensland Agricultural High School and College.

Natural swarm should be prevented from issuing, as far as possible, as in many cases they are lost; and even if safely hived, their formation not only interferes with nectar collection at the height of the season, but weakens the parent colony to such an extent that its value for producing surplus honey is reduced to very low limits.

Under those circumstances every endeavour should be made to increase colonies artificially. New colonies formed artificially have every chance of becoming strong and active honey producers, besides which, the strength of the parent colonies is reduced sufficiently to prevent them swarming naturally, but not to an extent which will interfere with the honey production.

Preparation for Increase.

Colonies must be carefully nursed to bring them to full strength early in the season. Syrup should, if necessary, be given to induce the queen to lay more eggs. This feeding is only required when the bees are solely dependent on the supply of nectar from the few flowers then in bloom. Artificial pollen should also be supplied. Most colonies have an abundance of food stored and need not be fed.

To assist the bees to increase their number rapidly, they must be crowded together and given no more comb than they can cover thickly. Crowding is attained by means of the division board, but as the strength of the colony increases the combs should be added, singly, as required.

Before dealing with the general methods of artificial increase three points must be made clear—

(1) Bees locate the position of their home, and not the hive to which they belong. Thus, if a stock is removed to a new position and is replaced by another hive, those bees on the wing return to the new hive in the original position.

(2) Natural swarms are made up of the oldest bees of the colony together with the old queen.

(3) Only strong colonies (those in which the bees are densely covering ten combs) must be utilised as the bases for artificial increase, and only colonies free from any disease must be used.

Methods of Increase.

1. *Formation of a nucleus.*—When the warm weather sets in about September, October, and November, a nucleus can be made from each strong colony in the following manner:—Open the hive about midday, when the old bees are away foraging, and remove two combs of brood and two of food, with the young bees, replacing them with four frames filled with sheets of foundation comb. It is necessary to have about a quart of bees and if this amount is not present on the combs removed, the number may be obtained by shaking the bees from two or three other combs into the nucleus.

Great care must be taken not to remove the queen with those combs. The two outer combs of the present body usually contain the most food, and should therefore be selected for use in the nucleus.

The combs containing the brood must be placed together between those containing the food in the new hive to provide warmth.

Close up and confine the bees in the nucleus hive for forty-eight hours. Close the entrance with wire gauze and the bees in the nucleus, discovering they are queenless, will rear a queen.

If a fertile queen, a virgin queen, or a ripe queen-cell is available it should be given. This will enable the nucleus to build up much more rapidly. With care this nucleus could be built up into a strong colony to winter successfully.

2. *Increasing the strength of the nucleus.*—When the queen in the nucleus formed in the manner mentioned in Method 1 has been mated and has commenced to lay, open the hive, find the queen and cage her on the comb.

When this is accomplished, fill up the hive containing the nucleus with either drawn out combs or frames fitted with full sheets of foundation comb to its full complement of ten frames. Transpose a strong stock to that of the nucleus, because

bees only locate the position of their hive, and not the hive itself, and consequently bees out foraging from the strong stock will return to the nucleus. Thus the hive containing the nucleus will become fully populated and sufficient young bees will be left in the old colony to enable it to recover strength rapidly. The queen cage and the nucleus are released after being confined for forty-eight hours.

About a fortnight after this operation has been carried out each hive will be sufficiently strong to receive a super, if favourable conditions have prevailed. Artificial increase by the combination of methods Nos. 1 and 2 is strongly recommended as producing the best results, owing to the fact that at no period when the colonies are strong they are queenless.

3. *Making one extra strong colony by utilising a number of others.*—In this method the increase is obtained by utilising several strong colonies of bees. From each of two of the colonies remove three combs of brood without the bees, and replace them with frames fitted with full sheets of foundation comb.

The six combs of brood thus obtained should then be placed in the centre of a fresh hive, with two of combs fitted with full sheets of wide foundation comb, on either side, thus making the number of frames up to ten. The third colony, from which no brood has been removed, is removed to a new site and is replaced by the hive containing the brood combs, which hive is then populated by the flying bees from the stock that has been removed to a new site.

Those bees will rear a new queen from the eggs in the combs. If, as stated in Method 1, a fertile or virgin queen or ripe queen-cell can be given, it will be a great advantage. The principle can be applied to a larger number of colonies by taking pure-brood combs from each, always arranging for one colony from which no brood combs have been taken to supply the bees.

The parent colonies used in forming the nucleus will be reduced in strength sufficiently to prevent them, in the majority of cases, from swarming naturally, and, provided care is exercised, they will not be weakened to such a degree that honey production is decreased to any great extent.

An Artificial Swarm.

4. *Formation of an artificial swarm.*—Open the hive containing the selected colony about 10 o'clock on the morning of a fine day. Search for the queen and when found, place the comb on which she is, together with the adhering bees, in a fresh hive in the centre of nine frames filled with full sheets of wired foundation comb.

Remove the parent stock to a new site and stand the fresh hive in its place. The bees from the parent stock which are out collecting nectar will return to this hive and form a new colony.

The young bees left in the parent hive will rear a queen, or a fertile, a virgin queen, or a ripe queen-cell can be given with advantage.

5. *To obtain surplus honey and yet retain increases of stock in the case of a colony swarming naturally.*—When, in spite of all precautions, a colony having a super or supers on it throws off a natural swarm, first hive the swarm in a temporary hive, then remove the parent stock to a new site, replacing it with the fresh hive containing ten frames fitted with sheets of wired foundation comb. Remove the supers, with their occupants, from the parent stock and place them over the frames in the new hives.

Then run the swarm into this ''supered'' hive in the usual way. By this method two strong colonies will be obtained, and, as all the foraging bees from the parent stock will join the swarm hived on the old location, the population will be increased sufficiently to enable them to complete the work of filling the supers.

6. *Casts or second swarms.*—Should it so happen that a cast swarm issues from a colony after it has swarmed naturally, provided it is known from which colony it issued, it should be returned.

Although casts can be built up strong enough to winter successfully their departure reduces the population of the parent colony to a dangerous degree.

Cast swarms should be returned in the same manner as a hived swarm on the second evening after the day of issue. If more than one cast swarm issues at the same time and it is not known from which colonies they came, they should be united so as to form one strong colony. This is accomplished by hiving them at the same time into their permanent hives. The excitement caused by throwing on to the hiving board together causes them to intermingle without fighting.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1925 AND 1924, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Nov.	Average Rainfall. No. of Years' Records.	Total Rainfall. Nov., 1925.	Total Rainfall. Nov., 1924.	Divisions and Stations.	Average Rainfall. Nov.	Average Rainfall. No. of Years' Records.	Total Rainfall. Nov., 1925.	Total Rainfall. Nov., 1924.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	2·13	24	0·60	6·79	Nambour	3·84	29	5·37	4·20
Cairns	4·02	43	2·16	7·01	Nanango	2·60	43	4·73	5·86
Cardwell	4·01	53	3·18	8·47	Rockhampton ...	2·22	38	1·50	3·83
Cooktown	2·70	49	1·39	4·09	Woodford ...	3·14	38	6·94	2·94
Herberton	2·49	38	1·61	10·02					
Ingham	3·60	33	0·43	2·99					
Innisfail	6·20	44	2·02	9·89	*Darling Downs.*				
Mossman	3·68	17	2·90	6·43					
Townsville	1·85	54	0·82	5·84	Dalby	2·64	55	3·83	4·14
					Emu Vale ...	2·65	29	5·17	4·27
					Jimbour	2·31	37	3·01	3·49
Central Coast.					Miles	2·43	40	2·17	4·42
					Stanthorpe ...	2·73	52	4·23	5·95
Ayr	1·74	38	0·27	2·08	Toowoomba ...	3·25	53	4·38	5·51
Bowen	1·30	54	0·39	3·59	Warwick	2·55	60	5·51	4·08
Charters Towers ...	1·51	43	...	1·49					
Mackay	2·93	54	0·86	6·53					
Proserpine	2·91	22	1·35	5·05					
St. Lawrence ...	2·28	54	1·75	2·39	*Maranoa.*				
					Roma	2·07	51	3 78	6·72
South Coast.									
Biggenden	2·68	26	2·66	3·82					
Bundaberg	2·55	42	1·29	4·03	*State Farms, &c.*				
Brisbane	3·69	74	8·53	6·29					
Childers	2·78	30	1·39	3·63	Bungeworgorai ...	2·25	11	2·57	7·79
Crohamhurst ...	4·39	30	7·47	4·21	Gatton College ...	2·58	25	5·94	3·93
Esk	3·12	38	5·45	3·98	Gindie	2·10	26	2·15	5·10
Gayndah	2·80	54	2·75	4·19	Hermitage ...	2·64	19	5·08	4·56
Gympie	3·13	55	5·46	2·19	Kairi	1·93	10	0·56	4·39
Caboolture	3·19	38	8·59	3·25	Sugar Experiment Station, Mackay	2·59	28	0·53	5·91
Kilkivan	2·59	46	2·41	3·47					
Maryborough ...	3·08	53	6·41	4·36	Warren	3·13	11	5·30	3·51

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November this year, and for the same period of 1924, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

STORAGE CHARGES AT HAMILTON COLD STORES.

A deputation representing the Queensland Co-operative Dairy Companies' Association, in the personnel of Messrs. J. T. Tod (President), W. T. Harris (Secretary,) F. J. Dobson, W. Dearling, and J. Mulcahy, waited on the Minister for Agriculture (Hon. W. Forgan Smith) recently and discussed with him matters appertaining to the charges to be imposed for the storage of dairy products at the Hamilton Cold Stores. The deputation requested that a reduction of the proposed charges be made.

The Minister intimated that the charges to be imposed at the Hamilton Cold Stores would be the same as already prevailed at Roma Street Cold Stores and at other cold stores in the metropolitan area. Mr. Smith pointed out that the storage charges must have relation to the operating costs, but intimated that the whole matter would be reviewed at the expiration of six months, when the Department would have the benefit of actual experience in operating costs at the Hamilton Stores.

The deputation also requested that provision be made under the Primary Producers' Co-operative Associations Act for the purpose of affording fuller protection to debenture holders. Mr. Smith informed the deputation that this question had already received his consideration, and that it was proposed to issue a regulation under the Act to give the desired relief. He thought such would meet the position as outlined by the deputation.

PIG CLUBS.

THEIR VALUE IN QUEENSLAND AGRICULTURE.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

Pig Clubs? What are they? What are they intended to convey or teach? Could they be successfully initiated in Queensland? How much would it cost and what staff would be required to carry them on? These and a host of other queries a year or two ago appeared to present a mountain of difficulty to the person to whom they were addressed, for Pig Clubs were not well understood then. They had not been tested out under local conditions, and there was but the published experience of American and Canadian Pig Clubs' specialists to fall back upon.

Since that date, however, a great deal of useful pioneering work has been attempted in initiating this popular and profitable educational activity, the result being that Boys' and Girls' Pig Clubs are now recognised as quite an attractive and interesting line of work in the curriculum of Queensland Rural and State Schools, particularly where these schools are favourably located in dairying, mixed farming, and fruitgrowing centres.

In an interesting speech at the Mapleton State School Pig Club fete recently, Mr. J. D. Story, Public Service Commissioner—to whom is due the credit of having emphasised the importance of these clubs and the urgency of having them put into operation—said that the Rural School movement and the schemes attendant upon their development (Pig Clubs, &c.) really had its birth in Queenlsand in the Mapleton district, although that was not generally known. He had spent a good many of his leisure hours in that famous mountain resort on the Blackall Range, and in pondering over various subjects had made a speciality of inquiring into movements which would specially interest children attending country schools, where they had not the many and varied conveniences and attractions of the city and the city schools. He was anxious that Queensland's country boys and girls should become leaders in these up-to-date movements, for it was highly desirable that these young folks should learn to love the country and their work so that the drift to the city and to city employment should at least be stemmed. Mr. J. B. McKenna, the Under Secretary to the Department of Public Instruction, also voiced Mr. Story's sentiments in regard to the Pig Club schemes. He expressed pleasure at seeing such tangible results of the efforts that had been put forward in the direction of fostering this branch of the Home Project Scheme. Mr. F. Watt, the Head Teacher of the Mapleton State School, joined in congratulating the boys and girls on the splendid results obtained in this their fourth School Pig Club. Reference was also made by Mr. Story to the work of the late Mr. Wm. Rowlands, Fruit Packing Instructor, and to the work of his successor Miss Nina Dunning, who had specially interested themselves in another branch of the scheme—viz., that relating to the proper grading and packing of fruit.

Mr. W. R. M. Steele, the Head Teacher of the Rural School, Nambour, and other teachers were also particularly interested and had done a great deal in fostering these several schemes.

The Pig Club movement has much to commend itself to the children of farmers who are interested in the raising of more and better pigs, for it aims first and foremost at educating the children, and at giving them an intensely practical acquaintance with the many and varied aspects of the breeding and management of pigs. That Pig Clubs can be initiated and carried through successfully has now been demonstrated on more than one occasion in this State, and the keen, intelligent interest taken in them by the junior farmers is definite proof that the movement is here to stay.

The Mapleton Pig Club Results.

Fifteen children competed together at the Mapleton Pig Club fete, held in the school grounds at Mapleton, on Saturday, 28th November, and the results herewith speak for themselves.

Some added explanation may not, however, be out of place in describing these details.

It will be noted from Table I. that the first column gives the number allotted to the competitor, this being purely for record purposes. Column 2 gives the name

of the competitors. They were all scholars of the Mapleton State School with the exception of John and Bowden Harding, children of an enthusiastic Pig Club worker, Mr. S. Harding, of Flaxton, at which centre these two children attend school. Column 3 quotes the name given to the pig by the competitor, while column 4 gives the breed or cross. It will be noted that there were some purebred pigs—viz., Victor Cordwell's pedigree Poland-China boar, and so on. It is one of the objectives of the Pig Club to be the medium through which purebred and better quality pigs might be introduced into the district and State.

Columns 5 and 6 state the age of the pigs when purchased and their weights. The weights were, in some instances, the estimated weight, but they were checked over by the Instructor in Pig Raising and may be taken as fairly reliable.

Column 7 gives the price paid, and in this connection see also Note A at foot of Table I.

Column 8 states the number of days the pig was fed for the purposes of this competition; the number of days varies considerably. This has been one of the most difficult problems associated with the development of the Pig Club scheme. Some parents are more cautious than others, and they desire to see the club in full swing before they will permit their children to join in. In some instances, owing to shortage in the supply of store pigs, club members found it quite a difficult matter securing satisfactory pigs with which to compete in the club. Several pigs were available but their purchase price was beyond the means of the child. In earlier clubs one or two pigs developed rickets and had to be culled out, while in later clubs some children were able to induce their parents to arrange for the purchase of purebred pigs and the purchase and delivery of these animals was, in one or two cases, much delayed. Thus it was that some members fed their pigs for as long as 121 days, whilst others had them less than two months, and in one case less than one month, but these are matters in which a good deal of judgment had to be exercised on the part of the organisers; they are all part of the game and we had no desire to prevent any child entering the club who had sufficient interest and enthusiasm to wish to join up.

Columns 9 and 10 give the actual age of the animal on Pig Club Day, 28th November, 1925, and the actual live weight. Every pig was carefully weighed ''over the scales,'' and for this latter purpose another Pig Club enthusiast, Mr. T. M. Forster, of the Forster Engineering Works, Mary street, Brisbane, has kindly donated for the use of these clubs, one of their Forster Patent Pig Grading Machines, a machine which embodies both a slide, a set of scales, and a portable pig crate, a combination providing a very useful apparatus for weighing, and in this way grading pork and bacon pigs.

For further particulars *re* this machine, see pamphlets on ''The Marketing of Pigs in Queensland,'' obtainable on application to the Department of Agriculture and Stock, Brisbane, where also many other useful Pig Raising pamphlets may be procured. It will be noted that the age of the pigs and their actual live weight also varied a good deal, but as there are no hard and fast rules in these Pig Clubs, pigs of varying ages and weights are catered for, and on judging day they are classified and penned and are judged accordingly.

Some pigs were classified as very light porkers, some as medium and heavy porkers. Others again as light and as medium or prime baconers. The judging and classification of the pigs at the Mapleton Fete was in the hands of Mr. F. W. Martin, secretary of Stock Agents Limited, of Roma street, Brisbane (an organisation representing the various proprietary bacon factories in Queensland), and of the Instructor in Pig Raising to the Department of Agriculture and Stock, Brisbane, the writer of this series of articles.

Column 11 is of very great interest as it shows the actual daily increase in weight of each animal over the period of days during which it was competing in the club. These figures will be of very wide interest also, for they show what is possible in the direction of profit making by feeding and caring for pigs on the proper lines. The most profitable animals in the competition in this regard made a daily increase in weight of more than 1 lb. per day, whilst the slowest growers gained at the rate of pretty well half a pound per day.

We are indebted to Mr. F. Watt, the Head Teacher of Mapleton School, for acting in the capacity of Controller of the Club and as a sort of clerk of the course or master of ceremonies on Club Day.

TABLE I.—MAPLETON STATE SCHOOL PIG CLUB.

Number for Record Purposes.	Name of Competitor.	Name of Pig.	Breed or Cross.	Age when Bought.	Weight when Bought.	Cost (see Note A).	Number of Days Fed.	Age 28th Nov.	Actual Live Weight 28th Nov.	Average Daily Increase.
				Weeks.	Lb.	£ s. d.			Lb.	Lb.
1	James Cramb	Spot	Berkshire-Tamworth	6	22	1 0 0	121	5½ months	165	1·18
2	Victor Cordwell	Broxburn Rover	Poland-China	9	60	6 6 0	16	3 months	81	1·3
3	Alwyn Neville	Biddy	Berkshire	5	18	1 0 0	107	4¾ months	126	1·0
4	Ronald Watt	Jill	Berkshire	5	15	1 0 0	82	4 months 5 days	85	0·86
5	Lillian Tucker	Daisy	Tamworth	6	20	5 5 0	51	3 months	72	1·0
6	Reginald Tucker	Laddie	Tamworth-Yorkshire	6	20	2 10 0	51	3 months	98	1·5
7	Fred Bruhn	Betty	Tamworth-Berkshire	6	20	1 0 0	121	5½ months	146	1·04
8	Dennis Herron	Brindle	Tamworth	5	15	1 0 0	59	3 months 1 week	81	1·12
9	Arthur Kuch	Lassie	Berkshire-Yorkshire	8	40	0 15 0	82	4½ months	121	1·0
10	Stanley Herron	Brownie	Tamworth-Berkshire	5	15	1 0 0	59	3 months 1 week	75	1·02
11	John Harding	Richard	Tamworth-Berkshire	7	15	0 18 0	109	5½ months	103	0·81
12	Bowden Harding	Gatton Rose	Berkshire	10	50	2 2 0	40	4 months	116	1·65
13	William Jeffs	Mabel	Berkshire	5	12	1 0 0	77	4 months	64	0·67
14	Rowland Bruhn	Bob	Yorkshire	6	25	1 0 0	130	6 months	155	1·0
15	Nellie Jeffs	Blackie	Berkshire	5	10½	1 0 0	77	4 months	45	0·45

NOTE A.—The figures shown in this column represent in the case of crossbred pigs or pigs purchased as stores the actual sum paid by the club member for the pig. In the case of the higher priced animals, the figure in the case of No. 2 is the actual stud value paid for the animal, in the case of No. 5 the price realised when this young sow was sold on Club Day, in the case of No. 6 the actual meat value on Club Day, and in the case of No. 12 the stud value as a weaner.

E. J. SHELTON, Instructor in Pig Raising.

30th November, 1925. F. E. WATT, Head Teacher, Mapleton.

TABLE II.—MAPLETON STATE SCHOOL PIG CLUB.

Number for Record Purposes.	Name of Competitor.	Marks Awarded.										Total.	Place in Competition.
		1	2	3	4	5	6	7	8	9	10		
1	James Cramb ..	14	9	15	10	5	10	5	10	10	10	98	1
2	Victor Cordwell ..	15	9	15	9	5	9	5	8	10	9	94	2
3	Alwyn Neville ..	15	8	14	9	5	10	5	9	8	10	93	3
4	Ronald Watt ..	14	7	15	10	5	10	5	10	10	7	93	3
5	Lillian Tucker ..	15	8	15	8	5	9	5	7	10	10	92	5
6	Reginald Tucker ..	13	10	15	8	5	9	5	8	10	8	91	6
7	Fred Bruhn ..	14	9	14	9	5	10	5	7	9	9	91	6
8	Dennis Herron ..	14	9	13	9	5	8	5	7	10	9	90	8
9	Arthur Kuch ..	14	8	14	9	5	9	5	8	7	9	88	9
10	Stanley Herron ..	14	9	13	9	5	8	5	8	8	8	87	10
11	John Harding ..	13	7	13	8	5	7	5	9	10	10	87	10
12	Bowden Harding	15	10	13	8	5	7	5	2	10	9	84	12
13	William Jeffs ..	13	7	12	6	4	7	5	8	8	9	79	13
14	Rowland Bruhn	13	8	14	8	5	5	5	..	10	10	78	14
15	Nellie Jeffs ..	12	6	12	6	4	7	5	10	7	8	77	15

Table II. reads in conjunction with the Pig Club Award Card, giving the following details. It was on this Score Card that the final results were based, and every competitor was supplied with a copy of this Award Card on becoming a member of the Club.

PIG CLUB AWARD CARD.

Points were awarded as follows:—	Possible Points.	Points *Awarded.
1. Type and quality of animal selected	15	
2. Rate of increase in weight of animal	10	
3. Cost of production; the use of home-grown foods being an important consideration	15	
4. Sanitation, condition of pig sty and grazing area ..	10	
5. Health of animal, freedom from parasites (lice, &c.)	5	
6. Interest shown in management of the animal by the club member	10	
7. Arrangements for marketing, exhibiting at show, &c.	5	
8. Essay on "How I Selected, Fed, Managed, and Exhibited my Pig"	10	
9. Market value of animal. Actual live and actual dressed weight and value per pound to be taken into consideration	10	
10. Order of Merit in Prize List at Show	10	
Possible	100	

* For points awarded, see Table II.

In connection with Table II. some added explanation is also necessary.

In Column 3, for instance, it will be noted that some children secured the maximum points (15); full points were awarded where the children had really good purebred pigs, for it is, as stated above, one of the objectives of the club to be the medium through which better pigs may be introduced into the district. Some of the purebreds were, however, not quite as good as the others, hence their total points were lower.

The rate of increase column (4), carried points in accordance with the daily increase as estimated on judging day. It will be noted that all the competitors scored very high points in the cost of production column. This is important, for it was shown that these pigs had cost little or nothing to produce—*i.e.*, they were fed on foods that would very largely have otherwise been classed as of little or no commercial value. Herein lies the great value of the pig as an asset on the farm, for he is, as history records him to be—

"The Husbandman's most useful scavenger,
The Housewife's most useful sink."

At any rate, the pigs were fed almost entirely on foods produced on the farms or on household scraps willingly donated by the parents and neighbours of those children residing in the township itself or thereabouts.

It has been a special objective in Pig Club work—and this has been specially emphasised by Mr. Steele, of Nambour, and his co-workers, in the Maroochy Shire Pig Clubs—to show that there is "Money in Pigs," and to demonstrate that the best way to make more money out of them is to produce them at a cheaper rate than heretofore, and this in its turn demands that the pigs must be fed on food produced on the farm in preference to food purchased at comparatively high prices from the storekeeper or the miller. It is admitted that the judicious use of concentrated foods, which in most instances have to be purchased, is often a payable proposition, but the amount of purchased food used in the Pig Clubs has been negligible, hence from that standpoint the objective of the club has been gained when it has been demonstrated that the pigs were almost entirely "home fed." The column giving points awarded for sanitation, &c., show that in almost every instance the pigs were kept under ideal conditions. This especially so as on official inspection day, on which day these points were awarded, heavy rain fell almost continuously and the inspection was carried out under anything but favourable conditions in so far as the competitors were concerned, for it is hardly to be expected that a pig's sty and its grazing area would be as clean and spic and span on a day during which, and prior to which, heavy rain had fallen (and it can rain up on the heights of Mapleton), and the red soil soon churns up into a good old mud bath. It will be noted also that the points awarded for health of animal, freedom from parasites (lice, &c.) were excellent. This indicates that the pigs were a very healthy lot, free from parasites of any description, a most important aspect and one well worthy of note in the children's essays, several of which will appear in the Pig Club pamphlet.

The lowest points awarded in the column allotted to interest shown in the management of the animal—viz., 5 points—was awarded to a little chap seven years old, who was awarded a special prize for the best exhibit shown by the youngest member of the club. His pig did not compete with the others for it was felt that he had not reached an age at which he could be charged with any responsibility in so far as his particular pig was concerned. He did very good work, however, in showing the interest he did.

The points awarded for the essay on "How I Selected, Fed, Managed, and Exhibited my Pig" varied somewhat, though all the essays were very creditable.

The little chap securing two points out of a possible ten was but a novice exhibitor; it was his first attempt, yet he showed a very fine Berkshire sow, a pedigree sow from the Gatton College stud. The points awarded for market value of the animal varied according to the quality and condition. It was a general remark that the whole of the pigs exhibited were of a very high standard, a standard which left little lacking in regard to quality and commercial value.

The total points awarded indicate that the principal prize winners scored very well. It might be remarked here that in the case of James Cramb, the winner of the championship in the open class, he had the assistance of a very enthusiastic schoolfellow, Fred Hill, of Mapleton. Fred did not have a pig in the contest, so it was

agreed that he and James Cramb would run a "company" pig, and as all the other club members were agreeable, they set to work determined to win and they put up a very fine record; as also did Victor Cordwell, the winner of the prize sash for the champion pig of the show exhibited by a novice exhibitor—an exhibitor who had not won a prize in any previous Pig Club. Victor showed a very fine Poland-China boar bred by Mr. J. H. Whittaker, of Victoria Park Stud, Broxburn, an animal who put a great record in the fortnight or more in which he was competing. In fact, each of the competitors did work of which any pig farmer might well be proud.

The list of prizes awarded were as follows:—

MAPLETON PIG CLUB, 28TH NOVEMBER, 1925—PRIZES AWARDED.

Name of Competitor.	Prize Awarded.
1. James Cramb (in partnership with Fred Hill)	Pedigree Berkshire Boar, donated by Mr. J. S. Jacobsen, of Mount Larcom, Q.
2. Victor Cordwell	Prize sash, donated by John S. Shaw, Ltd., of Ann and George Streets, Brisbane, per Mr. H. L. Griffiths.
3. Alwyn Neville	Gold Medal, presented by the Queensland Branch of the Australian Stud Pig Breeders' Society, Mr. R. G. Watson, Secretary.
3. Ronald Watt	Gold Medal, presented by the Queensland Branch of the Australian Stud Pig Breeders' Society, Mr. R. G. Watson, Secretary.
5. Lilian Tucker	Book Prizes, to the value of £1 1s., presented by Messrs. J. C. Hutton, Ltd., and Foggitt, Jones, Ltd., Brisbane, per Mr. F. W. Martin, of Brisbane.
6. Reginald Tucker	Cash Prize, £1 1s., donated by Mapleton School Committee.
6. Fred Bruhn..	Cash Prize, £1 1s., donated by Mrs. Ekin, of Mapleton.
8. Dennis Herron	Bag of Fertiliser, donated by Manager of Queensland Co-operative Bacon Association, Murarrie.
9. Arthur Kuch	Bag of Protein Meal, donated by Thos. Borthwick & Sons, of Wharf Street, Brisbane.
10. Stanley Herron	Cash Prize, 10s. 6d., donated by Mapleton School Committee.
10. John Harding	Cash Prize, 10s. 6d., donated by Messrs. Overells Ltd., The Valley, Brisbane.
12. Bowden, Harding	Cash Prize, 10s. 6d., donated by Mr. J. C. Dixon, of Flaxton.
13. William Jeffs	Cash Prize, 10s. 6d., donated by Mr. W. Anderson, of Mapleton.
14. Roland Bruhn	Cash Prize, 10s. 6d., donated by Mr. Thos. Walker, of Obi Obi.
15. Nellie Jeffs	Book Prizes, to value of 10s. 6d., presented by Messrs. J. C. Hutton, Ltd., and Foggitt, Jones, Ltd., Brisbane, per Mr. F. W. Martin.

Future Clubs.

A club is in operation at present at the Jarvisfield State School, *viâ* Ayr, Queensland, and it is expected that this will terminate during this half year.

Clubs will be initiated as early as possible at various centres along the North Coast Line in Queensland, and in as many other districts as time and circumstances will permit.

Those interested in this movement are invited to communicate with the writer at the Department of Agriculture and Stock, William street, Brisbane.

Copies of this article in Pig Club pamphlet form will be available towards the end of January or early in February, 1926.

DIPLOMA DAY AT GATTON.

TNE WORK OF THE QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE.

> **"The Courses at the College are so arranged that it turns out, not only Students trained in the practice and science of Agriculture, but men, worthy citizens of this great agricultural State.**
>
> **"The efficient farmer, who was a working man, was as much entitled to skilled wages as the maker of Australian ploughs, harvesters, or shirts."**—*Principal J. K. Murray.*

The ceremonies of Diploma Day at the Queensland Agricultural High School and College at Gatton on 15th December were a fitting closure to a successful academic year, and the college surroundings were enlivened by the decoration of the various buildings and the presence of many parents and friends of students. The visitors attended from many centres, and were entertained for the day by the Principal (Mr. J. K. Murray) and Mrs. Murray. After the heavy showers of the previous night, the weather conditions were pleasant, and the visitors enjoyed the outing immensely. They were met at the college siding by cars and drags from the college, and conveyed to the institution. After morning tea a tour was made of the several departments. The visit to the farm was abandoned owing to the moist condition of the soil, but the visitors found plenty to interest them in the exhibits of saddlery and harness, and sheet metal work, the butter factory, the animals, and the laboratory.

Among those invited were: The Federal Speaker (Sir Littleton E. Groom) and Lady Groom, the Minister for Public Instruction (Hon. T. Wilson) and Mrs. Wilson, the Under Secretary for Public Instruction (Mr. B. McKenna), the Assistant Chief Inspector (Mr. J. Riddell), and the Minister's private secretary (Mr. J. N. Larcombe), Messrs. W. J. Affleck (Chairman of the Council of the Royal National Agricultural and Industrial Association), W. E. Lingard (The Queensland Times Limited), H. W. Watson (Secretary of the Q.P. and A. Society), C. H. Jamieson (Chairman of the Queensland Butter Pool Board, J. F. F. Reid (Editor of Publications, Department of Agriculture and Stock), Councillors A. G. Kluck (Chairman) and A. McAllister, Laidley Shire Council; Councillors J. T. Yates (Chairman), J. Logan, and J. H. Raub, Tarampa Shire Council.

The Distribution.

The Minister for Public Instruction (Hon. T. Wilson) distributed the prizes, certificates, and trophies won in the sporting events. The ceremony took place in the gymnasium hall, which was packed.

The Principal (Mr. J. K. Murray) pointed out that this was the first occasion on which he had submitted a report such as he presented that day, to a similar gathering. He expressed thanks to the tractor companies for their support of tractor schools, and to the donors of prizes. He expressed appreciation of what the Royal National Association and the Commissioner of Irrigation had done for the students. Dealing with experiments, he said the college would do some valuable work in that direction, but the results would not be announced until they had been given an exhaustive trial. He expressed appreciation of the conduct of the boys, and he was confident that the standard of conduct of Gatton College boys would lose nothing by comparison with that of any other institution. He hoped they would realise that to belong to the college was a peculiar privilege, and that they had behind them the State of Queensland.

Minister's Speech.

The Minister expressed his gratification with the progress that the college was making. He was satisfied the boys were receiving an education that would make them a credit to the college. He recognised that the primary industries were of first importance in Queensland, and the value of the work at the college in combining

practical and scientific work. On that day they were making history, and he was sure the work of the college would make the institution loom greatly in the public eye. He congratulated winners of diplomas. In addition to the honour, these diplomas would be passports for their entry into the world of work. In 1914, the total vote for education was £675,658, and last year it had increased to £1,750,000. They could spend another £500,000, and then the schools would not be anything like up-to-date; but this institution, he believed, was making a name for itself throughout the world.

The College Spirit.

Sir Littleton Groom moved a vote of thanks to the Minister, and to Mr. Murray and his assistants for the interesting day they had given the visitors, and for the hospitality they had shown. The Minister had properly pointed out that this was an historic day for the students. They would take away ineffaceable memories of their stay at the college, and the culmination of their studentship there. He was pleased to hear the Principal say that there should be a spirit at the college, and that the boys should feel that they belonged to a society where men were being trained, and where they would breathe a spirit that would carry them through their lives, perhaps all over Australia. That spirit was formed by the friendships they would form at the college. The true spirit of friendship was formed there—a spirit that would make them feel that they would do anything rather than turn down those who had been their friends at the college. (Applause.) There was also at the college the spirit of good—the spirit of playing the game, in the sporting field as well as the class room. This spirit would make them feel that it would not be worth while if the mastery were not obtained by fair play. Then there was the spirit of idealism—the spirit that made them feel, after they left the college, that they would do something more. That idealism was given them by the example of those in whose charge they were placed. They had men at the college of high character, who tried to leave their impress on the boys. The college was training them to be citizens—that they must be prepared to stand alone. Their training at college would teach them to do a thing because it was right. Science did not humbug them. The laws of Nature could not be humbugged, and the idea of their training was to enable them to see accurately and deal justly. Their training also showed them that they could not go through the world alone; team work was necessary, and they had to act with other people in the world. He advised them not to be disappointed because they might once be turned down. There were many opportunities in life if they only would take them. They were grateful to the department which gave them such excellent opportunities for training. They lived in a scientific age, and the value of the college teaching largely lay in the research side.

Mr. Lingard seconded the motion of thanks, and voiced the congratulations of parents and scholars to Mr. Murray and members of his staff for the excellent work on which the coping stone had been placed that day.

Cheers were given for the Minister, the Principal, and the staff.

Principal's Report—Record Attendance.

The Principal, in his report, stated that the number of students attending courses during the year had constituted a record. The particulars were—Regular students, 80; short course students, 8; tractor school, 74; teachers' school 51; total, 213. Accommodation was overtaxed, and immediate increase in classrooms and dormitories was essential. He quoted from a leading article in the "Queensalnd Times": "When a boy leaves any school, the test is not his achievements in various examinations, but what he is himself." The courses were so designed, he said, that the Agricultural High School and College would turn out not only students trained in the science and practice of agriculture, but men, worthy citizens of this great agricultural State. In the curricula of agricultural colleges, the vocational side had generally been strong, but the cultural side weak, and graduates of the colleges had too frequently presented appalling English in their final examination papers. The curricula now in operation there ensured that the training in English was such as would remove this defect. Students were given ample practice in debating class work and essay writing. The class room and laboratory accommodation of the college had been neglected, a point stressed by committees which had made inquiries into the working of this institution. With a more sympathetic understanding of such needs, characteristic of an educational department, this deficiency would soon be a thing of the past. Already splendid progress had been made in the reconditioning and equipment of the chemical laboratory. A new bacteriological laboratory, the superior of any such laboratory attached to an Australian agricultural college, was in working order.

Improvements Needed.

A botanical and plant disease laboratory was required, and could be arranged in the main laboratory building as soon as a classroom block had been constructed. The room set aside in the laboratory building for the lecturer in plant breeding and genetics would require to be fitted and equipped in accordance with his ideas. The classroom block needed to contain a room which would accommodate 200 people comfortably. At the tractor schools, 140 people had been present at a lecture held in the gymnasium under uncomfortable conditions. The staff and students now numbered 90 people, and no suitable meeting place was available. The water supply of the college required improvement. Steps were taken this year to raise the main supply tank. This was found impracticable. The necessity for an increased storage and head was appreciated by all concerned with college welfare, and it was hoped that the matter would be proceeded with early in the new financial year. The Lecturer in Plant Breeding and Genetics (M. J. R. A. McMillan, B.Sc.Agr., Sydney; M.Sc., Cornell) would take up duty in the first week in January, and a private laboratory was being equipped to meet his requirements. He would be mainly engaged in the breeding of maize suited for Queensland conditions. Generous space had been devoted to college activities by the metropolitan and country Press. Very good progress had been made in fitting the college for its work in agricultural education. Noteworthy improvements had been effected in each department.

The staff had become a well-balanced one, though improvement was needed in some directions.

Tractor School.

The teacher's school, held in January, was attended by forty-four teachers drawn from most parts of the State. The enthusiasm of those attending made the instruction a distinct pleasure. A selected group of six teachers was now doing a six months' course in agriculture and farm crafts. The second tractor-school surpassed the first, and set a new record for attendance at farmers' instruction classes in Queensland. The machinery agents co-operated splendidly, forwarding nine tractors which, with the college three, made twelve available. Of these eleven were used, two were stripped for demonstrations in engine timing, valve grinding, decarbonising, &c. The remainder were used for field demonstrations in tractor driving. The machinery agents each sent a mechanic to instruct farmers in driving. School enthusiasm and Press tributes emphasised the value of this extension of college activities to meet the needs of the adult farming population.

The moral and spiritual welfare of the students was the especial and earnest care of clergymen of the several denominations represented within the district.

The conduct of the students had been very good during the year, and they maintained a standard of conduct worthy of the State College of Agriculture. The health of the students probably was on a higher level in the institution than in most other similar schools. The college was largely dependent on itself for social life. It was hoped to place a wireless plant and cinematograph at the college. Carefully selected pictures were essential for the junior boys.

College Sports.

The main recreations had been cricket, tennis, and Rugby League football. The college was leading in the competition of the Lockyer Cricket Association. Friendly games in Rugby League football had been played with the associated secondary schools.

The College Farm.

Some splendid crops had been grown. Florence wheat yielded 33 bushels per acre, and Huguenot 3 tons of hay per acre. The lucerne was yielding heavily. Variety and fertiliser trials in cotton, maize, wheat, and lucerne were being conducted, but it was much too early to give definite guidance. Some very good additions had been made to cattle, pigs, and sheep during the year. Full advantage was taken of the splendid facilities offered students by the council at the Royal National Show, at which the college had an extensive display of its activities.

Needs of the Day.

The outstanding requirements to-day of farming were: (1) More efficient production; (2) more efficient distribution; (3) better treatment by the community of farmers in the matter of prices. More efficient production could be effected by using better animals and plants, cows of higher production, pigs of quicker and more

economic growth, of maize and other crops. Better and more efficient cultivation was required. Australia's problem was not rainfall, but conservation of rainfall. The Lockyer received more rain in a year than London did. The early breaking up of paddocks to let rains into the soil, instead of running into creeks; the stirring of the soil surface after rains to check the huge loss of water through weeds and by evaporation from the surface—these measures were essential. The better education of the rural community, adult and child, was required. The attitude of the farmer to agricultural education was peculiar. He commonly stated that if a boy wanted to learn farming he should stay at home. As well might a doctor learn his profession from his father rather than at a university. Such an attitude, if widely adopted, would give us medicine men in place of medical men, and in respect to farming it was responsible for keeping the standard of farming much below that consonant with the available world knowledge of scientific agriculture. The Agricultural High School needed the farmers' sons and the State's interests required that they should come. Better distribution was required. The inefficiency of distribution of farm products was a byword. There was more than this, however. The farmer was again and again referred to as the backbone of the country. Like their own backbones, it was convenient to have, but given little consideration. It were better if they were able to refer to the farmer as the brains of the country. There was more than standing room for brains in agriculture. If the farmer used his head more they would have better farming, improved distribution of farm products, and a return (for Australian-consumed products) based on cost of production plus a fair profit. Now such a return required, as a *sine qua non*, efficient farming. Price-fixing could only be based on the costs of production of an efficient farm.

It could not be gainsaid that the average farmer in that district was not receiving the basic wage based on returns over an average of years. To put the matter bluntly, butter was being sold to well-paid Australians at rates which spelt sweated labour for farmers, their wives, and children. It was a state of affairs which was not compatible with our national honour. The efficient farmer, who was a working man, was as much entitled to skilled wages as the maker of Australian ploughs, harvesters, or shirts.

PRIZE LIST.

Agriculture V.

J. A. Kerr: The Queensland Diploma in Agriculture (second class honours), dux. "Queensland Times" prize; best practical student, the Royal National Agricultural and Industrial Association's prize.

S. Dodds: The Queensland Diploma in Agriculture, second aggregate prize.

E. McCarthy and H. McK. Davie: The Queensland Diploma in Agriculture.

Dairying V.

D. H. Stephens, Q.D.A.: Queensland Diploma in Dairying, with first class honours, dux; "Queensland Times" prize.

M. R. Muller and J. E. Maher: Queensland Diploma in Dairying.

Agriculture III.

R. McAllister: First aggregate and first in botany, engineering, horticulture, veterinary science, poultry, agriculture, dairying, and equal first live stock; second practical chemistry; and third English.

R. A. Price: Second aggregate; second in botany, English, engineering, mensuration; and third in chemistry and agriculture.

J. C. Spencer: Third aggregate; first in chemistry and practical chemistry; second in agriculture and horticulture; third veterinary science; and equal third in poultry.

J. T. Tod: Fourth aggregate; equal first in live stock and mensuration; second in chemistry, veterinary science; third agriculture; and equal third in botany.

G. Sigley: Fifth aggregate; equal first mensuration; second poultry and dairying.

A. Hulme: Equal first live stock; and equal third botany.

A. Nixon Smith: First English; third dairying; and equal third botany and poultry.

P. W. Hamon: Equal first mensuration.

T. G. Graham: Third practical chemistry.

AGRICULTURE I.

T. H. Ayles: First aggregate; first in geometry, English, arithmetic, and botany; third in agriculture.

R. Burns: Second aggregate; first dairying and agriculture; second horticulture, botany; equal second English; third in live stock and poultry.

C. R. Grieve: Third aggregate; first chemistry; second algebra, soil physics, arithmetic, and live stock.

M. Reeve: Fourth aggregate; first poultry; equal second chemistry and geometry; and equal third engineering.

K. McLennan: Fifth aggregate; first engineering; second dairying; and third horticulture.

R. Baxter: Sixth aggregate; equal second English; third algebra, soil physics; and equal third in engineering.

S. Reeve: Seventh aggregate; first in horticulture; second chemistry, poultry; and third geometry.

R. Burns: Essay on "The National Show," R.N.A. and I.A.'s prize.

J. Martin: First algebra and soil physics.

N. Hill: First live stock; and second agriculture.

H. S. Smith: Equal third chemistry.

W. Steele: Equal second English.

A. M. Himstedt: Third English.

A. R. Wallace: Third arithmetic.

B. Bannikoff: Third dairying and botany.

A. Hing: Second engineering.

AGRICULTURE IV.

C. A. Schroder: First aggregate; first chemistry, engineering, live stock, veterinary science, agriculture, and milk and cream testing; equal second in practical agriculture and sheep and wool.

C. S. Christian: Second aggregate; first in practical sheep and wool; second in engineering, live stock, horticulture; equal second in sheep and wool; and third in chemistry, English, bookkeeping, veterinary science, and agriculture.

D. O. Atherton: Third aggregate; first in sheep and wool; equal first bookkeeping; second in chemistry and veterinary science; equal second practical agriculture; and third practical chemistry, live stock, and practical sheep and wool.

V. J. Brimblecombe: Best practical student, R.N.A. and I. Association prize; third in bookkeeping; and equal third in practical sheep and wool.

W. Aplin: First in practical chemistry; second practical sheep and wool; third in practical agriculture; and equal third English and sheep and wool.

F. C. Coleman: Equal first in bookkeeping; second in practical chemistry; equal second sheep and wool; equal third in engineering; and third in cream and milk testing.

A. F. Moodie: Equal first in bookkeeping; second in English, milk and cream testing, and agriculture; equal second practical sheep and wool; and third horticulture.

The following students passed the fourth year examination for the Diploma in Agriculture:—C. A. Schroder, 78·4 per cent; C. S. Christian, 77·6; D. O. Atherton, 77·3; A. F. Moodie, 75·8; W. Aplin, 71; V. J. Brimblecombe, 67·5; F. C. Coleman, 67·2; A. R. McKenzie, 58·3; F. P. Harvey, 56·4; W. Horneman, 54·6.

The comments of outside examiners had been favourable.

Students who passed the third year examination for the Diplomas of Agriculture:—F. McAllister, 80·5 per cent; R. A. Price, 75·9; J. C. Spencer, 73·9; J. G. Tod, 70·9; A. Hulme, 66·4; P. W. Hamon, 64·7; J. Ferguson, 64·6; T. G. Graham, 64·6; O. Pommer, 56·8.

Students who passed the first year examination for the Diploma in Agriculture:—T. H. Ayles, 79·1; R. Burns, 76·6; C. R. Grieve, 75·5; M. Reeve, 74·8; K. McLennan, 71·8; R. Baxter, 71·7; S. Reeve, 71; H. S. Smith, 69·4; A. M. Himstedt, 69; A. S. M. Hing, 68·8; A. R. Wallace, 67·7; N. Hill, 66·8; W. G. Steele, 66·3; G. Horn, 65·3; J. Martin, 65; B. Bannikoff, 63·2; R. C. Gregory, 62·9; I. G. Meddleton, 62·6; W. Akers, 59·6; G. Espie, 57; J. Griffith, 55; J. Ladewig, 54·7; E. Ladewig, 54; J. Rea, 52·7; R. Gillies, 51·3; V. Cooper, 50.

Students who have followed special courses:—C. H. Thiele, T. O'Connell, G. Litfin, G. F. D. Wadsworth, R. MacHardy, A. Wearing, W. Rahilly, G. Morgan.

FERTILISING EXPERIMENTS.

APPOINTMENT OF A DEPARTMENTAL ADVISORY COMMITTEE.

A Departmental Manurial Experimentation Advisory Committee has been formed with the object of designing and supervising fertilising experiments and other related activities. The chiefs of the several branches concerned form the personnel of the committee, which held its first business meeting in the Library of the Chemical Laboratory on 4th December. There were present Messrs. J. C. Brünnich (Agricultural Chemist), chairman, E. Graham (Under Secretary), H. C. Quodling (Director of Agriculture), A. H. Benson (Director of Fruit Culture), F. F. Coleman (Officer in Charge of Pure Seeds, Fertilisers, and Stock Foods Branch), J. F. F. Reid, Editor of Publications).

The Under Secretary (Mr. Graham), in outlining the objects for which the committee has been set up, said that it was expected to give full consideration to all manurial experimental work that came within the purview of, or that was undertaken by, the Department of Agriculture and Stock. Sugar and cotton fertilising experiments were excepted, as they are already fully covered by the Bureau of Sugar Experiment Stations and the Cotton Branch respectively. In constituting the committee he had kept in mind the fact that manurial work had two aspects, the technical or laboratory side and practical work in the field. Its object was to promote efficient team work. The co-operation of laboratory technicians with field officers was absolutely necessary. Co-ordinated effort and a combination of those skilled in both processes were essential to success. Both sides were represented fully on the committee, the personnel of which was not, however, limited to those appointed. It had the power to co-opt other officers when necessary. As the work progressed it might become necessary to invoke the assistance of the Government Botanist, particularly in relation to pasture improvement, and also other officers when any specific problem in which they are especially interested is being considered. While the functions of the committee would for the present be limited to manurial experiments, that did not mean that they may not be extended later to embrace other spheres of work. The economical use of fertilisers would be their especial concern. Generally farmers did not use manures economically with a view to obtaining maximum results. Manure, as they all knew, could be so applied as to produce high yields; but high yields were often obtained at too great a cost. It would be the task of the committee to devise plans by which fertilisers may be applied economically—that is to say, to yield a profit to the farmer.

Referring to the relationship of field officers to the committee, Mr. Graham said that it might be permissible, advisable, and indeed necessary for field men to become associated actively with its work. They might be empowered to initiate experiments and submit results to the committee through the chiefs of their respective branches. They might also submit proposals which could be sifted by the committee. It was not necessary, however, to directly co-opt field officers, as each branch by the constitution of the committee was already sufficiently and efficiently represented by its respective head. To invoke the co-operation of field staffs and utilise their services came already within the scope of the committee.

The heads of the branches concerned would naturally exercise a supervision over experiments in their respective zones of work. Fields for experiment could be provided on the several State Farms, special consideration, perhaps, being given to the provision of facilities at the Yeerongpilly Stock Experiment Station on account of its proximity and easy accessibility. Arrangements could also be entered into with farmers for the setting apart and utilising of certain areas on which work could be followed up to finalisation. Results and conclusions could be described, tabulated, and presented in readable and easily digestible form in the "Queensland Agricultural Journal" and other departmental publications. That particular work would, of course, come within the range of the Editor of Publications (Mr. Reid).

No funds had been set aside specifically for the work of the committee, and it would have to rely on the provision made in existing votes. A special financial provision was, at that stage, not quite practicable, but no doubt it would be considered when the next Estimates were being framed. By that time the committee would be in a better position to say definitely what experiments would be necessary and what would be their probable cost. The work of the committee itself would be carried out during official hours. Experiments at present in progress would be brought under its control and be encompassed in its work.

General Notes.

Why Boys Leave the Farm.

In the course of a discussion on the city-ward drift of rural population at a meeting of the Goode Branch of the Agricultural Bureau of South Australia, it was stated that farmers had pioneered without agricultural knowledge, with poor implements, lack of finance, and many more difficulties which had to be surmounted before success could be attained. They often fostered the thought that some day their sons would relieve them of their past strenuous duties, and later on take full control when things were running more smoothly. But to the keen disappointment of the farmer the boys left the farm when they would be most useful, and went to the cities. To the farmer that was a calamity, but very often it was his own fault. The farmer might be a good worker and farmer, but too frequently he overlooked the social side of farm life. The paper then read as follows:—"Do we take our boys sufficiently into our confidence, tell them what we propose to do, and how the work is to be done? Do we give them any actual and practical interest, and responsible jobs to do, which in doing make them feel that they are doing something of practical use on the farm? Farming is a serious business, but do we take the trouble to initiate the boys into its mysteries of moisture conservation, soils, seasons, seed, machinery, sheep, buying and selling, &c.? If this is done, farmers would be gradually instilling into young minds the best knowledge of farming they can get. Then our sons will know why things have to be done, and will do the work intelligently and with added pleasure. Do we give the rising generation sufficient time for recreation and amusement? Do we keep them going six full days a week, and possibly a portion of the seventh? It is only natural that the young folk should be allowed to seek good company of others of their own age." Continuing, it was stated that the boys would be quick to realise that, during the busy seasons, they could not expect many afternoons off for recreation, but could do so during the slack periods. Even in the very remote districts, where football, cricket, or tennis would be practically impossible, hunting very often provided a healthy form of amusement for both old and young, and, with the advent of wireless, a very enjoyable evening could follow for the whole family. Wherever possible music should be in every home. A pianola was a valuable instrument, on which all the latest music could be played. Many farmers were apt to say, "Who gave us these amusements and time for recreation?" In the days of early settlement the entire family worked on the farm. Little time was spent in going to school, in reading, or in travel. The few farm tools were so crude, and the farming so poorly done, that a family raised little more in value than it consumed, worked as hard and as long as they could, and even then the family was often threatened with famine. In those days farming was largely a question of man and animal power persistently toiling hour after hour. Implements were primitive, motor cars were in their infancy, telephones an expensive luxury, lighting installations imperfect, super. untried and unpopular. To-day they were essentials. Conditions had changed, and the boys were living in a mechanical and scientific age, an age where everything was done to save time, to reduce expensive and irksome labour, to make life easier, and conditions more enjoyable. With better farming fewer farmers were needed, for statistics showed a greater production per head. That placed the present-day farmer in a position far ahead of his forefathers. Life to-day was more comfortable, more time was provided for recreation, and they found themselves in a position to partake of the essentials and sometimes of the luxuries that life now afforded. He thought it advisable to give each farm boy a choice of occupation, especially if he showed an adaptability to such occupation. They should, of course, first try to initiate him into farming pursuits, but should that prove fruitless, then the lad should be given his choice. It had long been recognised that for every farmer three men were required in the city to handle his products, and turn them into commodities. With the latest power farming, improved implements, and motor cars, it would probably take six men in town to handle his products and supply his wants. Therefore they should not be alarmed when a drift to the cities was noticed. The price of farm products would always have a great influence on the drift either towards the country or city. It could be deduced that it did not altogether rest with the farmer to find out the solution for retaining the young farming generation; much would depend on the foresight of the Government in finding suitable markets overseas before over-production was experienced.

Points about Pit Silos.

Some useful suggestions in relation to pit ensilage were made in the course of a recent conference of instructors of the Department of Agriculture, New South Wales. By conversation with men who had filled pits for some years, and by personal observation, said the writer of a paper on the subject, several points in connection with the work of filling and emptying pits had appealed to him as being possible improvements over the usually accepted methods.

It was noticeable that the general tendency of the novice in silage-making was to make the pits deeper and wider than was advisable. In one case which had come before his notice recently a farmer had excavated a pit 10 feet square and 10 feet deep by pick and shovel, and knew of no other way until put on the right track. But experience soon taught that deep pits increased the labour of filling and emptying, and the trend of the experienced was towards even shallower pits than were usually recommended, and the quality of the silage turned out seemed to be good.

Wheat, oats, or barley were generally used, but in one case last season silage was successfully made from a mixture consisting mainly of variegated thistles. The writer's advice was asked by a farmer who had sown 10 acres of lucerne on the Macquarie River flats as to how he could best get rid of a tremendous crop of thistles which had come up with the young lucerne plants, and which was threatening to kill out the lucerne by excluding the sunlight. This thistle crop was estimated to be at least 10 tons per acre. It was suggested that he kill two birds with one stone by cutting the thistles and lucerne with a mower while still green, and putting the mixture into a silage pit. As there was a possibility that the material would be too sappy and become mushy, about 10 acres of a wheat crop was cut and put in with the thistles, in the proportion of one load of wheat to two of thistles. The resultant silage proved to be excellent.

Most of the cereal crops were cut with a binder. There were differences of opinion as to the best methods of filling the pit. Some advocated putting the sheaves in crossways, the contention being that it made for easier work in emptying. The method did not appear to affect greatly the settling down of the material.

A good point that had come under his notice, and that had been gained by experience by two silage-makers of several years' standing, was that in building up the pit above the ground level the height should be made to correspond to the depth of the pit—*i.e.*, where the pit was, say, 6 feet deep, the material should be stacked 6 feet high, and then sloped off according to the slope of the batter. It had also been found that there was often a tendency for a shrinkage of the material away from the walls of the pit, allowing the covering earth to crack and open and permitting run-off water to get down the sides during rain; this, together with the air so admitted, tended to spoil a greater percentage of the silage than was usual in well-filled pits. In order to avoid this, the plan of over-lapping the sheaves about 6 inches beyond the sides of the pit when building up above the ground level had been adopted. Then the main mass of the material, on settling down by its own weight, dragged this overlapping material in and down the sides, and thereby prevented any undue shrinkage from the walls.

A method of lessening the work when covering the material with earth could also be recommended. When topping off the portion stacked above ground level, it was built somewhat similar to a haystack, and a final double row of sheaves was overlapped along the ridge. The earth excavated from the pit was first dumped along this ridge by means of a bucket scoop, putting sufficient on to bind the mass thoroughly, taking the earth up from the ends. Then the balance of the covering was done from the sides, commencing at ground level, and putting each successive scoop full on top of the preceding one, working from each side alternately until the material was covered with a sufficient layer of earth. This method tended to make the work of covering the pit less tedious than when all the earth was taken up from the ends, which was the method usually adopted.

Planting Bananas.

Bananas are planted at all seasons of the year, but October is considered the best month in this State, as the growth is much more rapid with early spring plantings than with later ones.

One of the most important points in the growing of bananas and one to which very little attention is given by the majority of growers is the selection and the treatment of suckers for planting. One hears a great deal about seed selection, say, of maize and wheat, and of increased crop returns and general improvement arising from any little attention to the matter, but one does not meet many banana-growers who recognise how largely the careful selection of suckers affects the future life of the plantation, not only in regard to the yield of fruit but more particularly in regard to freedom from disease.

Most growers know that the sucker with greatest vigour is the one with a good bulb and with small, narrow leaves; this type of sucker is always a good grower, and always produces a good bunch. The size of the sucker is not of so much importance as the size of the bulb. The bulb is simply food stored away, and therefore the larger the bulb the larger the amount of food there is for the plant to use to tide over the shock of removal and replanting, as well as in the production of fresh roots in its new home.

Always reject suckers with poor bulbs and trunks of uniform girth, and select only those with good bulbs and tapering (or "bottle-shaped") trunks; by so doing you will obtain vigorous plants and will make the best of the soil and weather conditions. Of course, one of the most vigorous plants of all is the old butt with all but one eye pruned away; a plentiful supply of food is assured by the old butt, and the young plant, besides overtaking larger suckers in the matter of growth, produces a larger and better bunch, and at a time when prices are good. It is a mistake to split the butts into four and six "sets" or "slips," as some do, for the effect is positively to check vigorous development, and also to expose a large surface to fungus invasion. The less cut surface there is the less liability to fungas and bacterial attack.

Damage from Dust—A Point for the Grazing Farmer.

The damage done to the prospective wool clip by unnecessary exposure of the flock to dust is the subject of reminder in a publication of the Western Australian Department of Agriculture. Too little attention is given to the sheep immediately after they are shorn, in preventing the mob from raising dust, which penetrates to the skin, and remains to form the tip of the staple. Not only does this dust spoil the appearance of the wool, but it absorbs the natural grease, which should flow to the tip of each fibre, keeping it healthy and sound. For the want of nourishment this tip becomes dry and fuzzy, greatly increasing the proportion of "noils" after the process of scouring and combing.

Every effort should be made when driving or mustering sheep to allow them as much spread as possible, for in their congregation by the rounding up with dogs clouds of dust are raised, and this earthy tip is worked deeper into the staple. The tip of the wool readily absorbs the slightest dust or foreign matter, and is seriously affected by driving along a dusty road for even a mile or two. Once this dust adheres to the tip it remains there, and this often accounts for the difference in price of wool where one farmer purchases part of another grower's flock and drives it a few miles to his own property.

The same difference often shows up where farmers buy sheep at a saleyard out of the same flock, dividing them and driving them home by different roads. The road having less traffic than the other is usually cleaner, and the sheep arrive with less dust in their fleeces, in consequence of which the wool when shorn is worth more per pound.

It is the care of the sheep, and the prevention of dust from getting into the fleece from the day they leave the shearing board until such time as they arrive to be shorn the next season, that makes the wool bright instead of dingy and shabby.

Station owners often complain that the remaining portion of their clip has not brought as much money as that first shorn. This is often caused by the yards becoming more dusty as shearing proceeds, or doing an amount of drafting and longer droving just previous to shearing.

Every atom of dust that adheres to the fleece reduces its yield and detracts from the appearance and brilliancy of the wool.

A Square Deal—The Plaint of the Discontented Dairyman.

In visiting the various butter factories, says a departmental worker in the New South Wales "Agricultural Gazette," Dairy Branch officials are frequently impressed with the amount of cream received from neighbouring districts in which butter factories are known to be in operation. In some instances it has been noted that cream has been sent 100 miles or more from the home butter factory, and during the journey has probably passed the doors of quite a number of other butter factories before reaching its destination. On various occasions inquiries have been made as to the reason—why suppliers send their cream away from the home factory—and in nearly every case so inquired into the factory manager concerned will state that these suppliers are discontented with the test grade or results, or both.

If the matter is taken further, and one gets into personal touch with the suppliers themselves, they will almost invariably state that they do not get a "square deal" at the home factory, that they are being "robbed" in weight, test, or grade; and in some cases not only do they state that the weights, tests, and grades are wrong, but that the error is made deliberately by the factory.

It is very difficult to prove the correctness of these assertions, so freely indulged in, especially in regard to the matter of weight and test, for rarely indeed are either scales or testing apparatus to be found on the farm. As for the grades, the factory grader, whose aim is to place as much cream into choicest quality as possible without injuring the resultant butter, is the more likely person to give an absolutely unbiassed opinion in regard to the standard of the cream. These graders, who are examined by the Dairy Branch and receive scientific instruction in this regard, have positively no reason to place a choicest cream into first or second grade, or *vice versa*. Whatever the grading of the cream, the result exhibits itself in the butter, and the Dairy Branch officials whose duty it is to examine the butter know very promptly whether the grading is being correctly carried out. So it is seen at once that incorrect grading, either on the generous or vicious side, speedily brings its own reward for the cream-grader concerned in the grading of his butter, every grader of cream being compelled to grade correctly or incur the risk of having his certificate cancelled.

In some instances, unfortunately, the disgruntled supplier is not satisfied with sending the cream out of the district, but patrols the neighbourhood, sowing seeds of discontent; often stooping to untruths in explaining to his fellow dairymen the treatment he imagines he has received, in the endeavour to induce others to forsake their own factory and send their cream to some particular factory or other at which the discontented one loudly proclaims he receives a ''square deal.''

The article is worthy of the notice of every dairy-farmer, presenting as it does a balanced argument for a zone system of cream supply. If zones or boundaries were agreed upon by the various factories for the collection of cream, and no factory would accept cream from another factory's zone, the class of discontented supplier described would immediately cease to exist. He would either have to supply his own local factory or treat his own cream himself, or so improve his methods as to produce a genuine, good quality article.

Lucerne Haymaking—When to Cut.

Lucerne is more difficult to cure than any other kind of hay crop, and greater loss occurs to it than any other when improperly treated. Careful handling is required from the time the crop is cut until the hay is baled for market. The eagerness with which buyers snap up well-cured lots of lucerne hay indicates the importance of curing and of marketing in the very best condition. They prefer hay that is bright, green, dry, free from weeds and rubbish, and that contains a large proportion of leaf. A dirty appearance, indicating careless handling in the field, or the slightest sign of heating in the bale, cause buyers to reject the lot or to only accept it at much reduced prices. Since quality is of just the same importance when lucerne hay is fed on the farm the same care is necessary in its treatment.

Lucerne should be cut just after the first flowers have appeared, though many growers prefer to watch the crown for the young shoots of the next cut. Much more depends upon the selection of the right time to cut lucerne than with other hay crops. In the latter cases loss is chiefly due to deterioration in digestibility, but in lucerne the loss is not confined to this but extends to actual loss of weight in the hay and to poorer growth in the succeeding crop. After lucerne flowers the nutriment in the stems and leaves is withdrawn and transferred to the upper portions of the plant, and the stems harden and become indigestible, and of less value as food. The leaves wither also and begin to fall, which results in loss of weight, and as these are the richest portion of the plant every effort should be made to retain them in the hay.

No advantage is obtained when the crop is allowed to remain uncut past the stage recommended. The only time when such a course is justifiable is when the weather is unsuitable for hay-making, and the crop is left standing until good weather is assured. A loss in the succeeding cuttings also follows when cutting is left past the time indicated. This loss is due to two things. When the crop is left uncut until past flowering it is found that the succeeding crop does not start away so quickly as it does when the cut has been made earlier. Secondly, loss occurs through the greater time which the crop occupies the land. Lucerne only grows during the summer, and, provided rain is plentiful, good crops can be obtained at frequent intervals. If the average time for a cut of lucerne be taken at six weeks, and five cuts are obtained in a season of thirty weeks, it means that if each cut is allowed to stand seven weeks only four cuts can be obtained, which means an actual loss of 15 cwt. to 1 ton of hay per acre per annum.

It usually happens that owing to the cool weather the first growth of the season is late in flowering, and the leaves begin to drop and the stems to harden before the bloom appears. The crop should be carefully watched and the cutting made when the lower leaves begin to change their colour.

Cutting is done with the mower or scythe. A time should be selected when the crop is at the right stage, and when there is a prospect of fine weather lasting

until curing is completed. Showery or cloudy weather renders curing difficult, and hay of the best quality cannot be made. The usual practice is to start the mower going in the morning as early as possible, but if a heavy dew is on the crop cutting should be deferred until it has evaporated. External moisture, owing either to rain or dew, is objectionable, and causes deterioration in the quality.—"Agricultural and Pastoral Notes," New South Wales Department of Agriculture.

The Extraction of Honey.

The term "extracting" is generally used to cover the combined processes of (1) removing combs from the hive, (2) uncapping the combs, and (3) extracting the honey by means of the honey extractor. There is no set period for extracting; there may be a honey flow fairly early in the season, while at times the apiarist will not extract any surplus until the autumn. Again, there are seasons in which the flow may last all through. A safe plan for the beginner who desires to know when to extract is, when the colonies are progressive and the super or supers nearly full of sealed stores, to place over the brood nest and under the supers a fresh super, the frames of which contain comb foundation or empty combs. When good progress has been made in this super, the apiarist can consider it is time to extract surplus from the sealed stores above.

The beginner should always keep in mind the fact that bees require a fair surplus of stores during early spring if they are to be progressive in brood raising, while in the late autumn ample stores should be left with the colonies to carry them safely over winter. Until experience is gained in regulating these matters, it is best for the beginner to keep a little on the safe side. The bees usually give an indication as to the supply of available nectar. For instance, if they are inclined to rush any combs left out of a hive for a minute or so, or endeavour to raid the extracting house to any extent during mild weather, the apiarist can be assured that there is a scarcity of nectar. The same can be said as regards pollen when the bees endeavour to obtain a substitute by raiding the bran, pollard, or flour bins; but in this case the substitute is useless. The beginner is advised to take notice of these indications, for even a practical apiarist is usually guided by them, especially in a new locality. Do not stint your bees during a dearth of nectar.

A Wire-holder for Apiarists.

There are various ways of disposing of the spool of wire while wiring beehive frames, but surprisingly few of them seem to be quite satisfactory, and the spectacle of the wire winding itself in all directions to the inconvenience and annoyance of all concerned is common.

A handy wire holder is quite easily made from a few bits of deal, a skewer, and a piece of thin steel for the spring. A rough box is made, through the sides of which the skewer is passed, the wire bobbin running free on the skewer between the sides. A small board, made so as to press on the bobbin, and held in place by the steel spring, completes the outfit, which can be hung on the wall in a convenient place. With the help of this holder the problem of where to put the bobbin while wiring is solved, and the wire is made available minus all objectionable kinks.

Spread of Noxious Weeds—How some Fruitgrowers Contribute.

Fruitgrowers and others who import parcels of plants from other States contribute largely to the spread of noxious growths by neglecting to burn packings and coverings which often contain weed seeds. These are dumped on the rubbish heap or allowed to be scattered around the farmyard. The near-sightedness of this practice is obvious.

Staff Changes and Appointments.

Mr. S. T. J. Clarke has been appointed a senior field assistant to the cotton section of the department.

The police magistrate, Bowen, and Mr. J. Taylor, stock inspector, Maryborough, have been appointed Government representatives on the Dingo Boards for the Dingo Districts of Bowen and Wide Bay respectively. Messrs. A. H. W. Cunningham, A. J. Hall-Scott, J. A. Rowan, and J. E. Kelly have been elected members of the Bowen Dingo Board; and Messrs. J. C. Evans, F. M. Hooke, H. J. Hyne, and F. G. Lavaring have been elected members of the Wide Bay Dingo Board.

Messrs. F. H. Hyde and R. T. Croker have been appointed deputies to act as members on the Atherton Tableland Pig Board as from the 1st December, 1925, in place of Messrs. H. H. Collins and C. R. Davidson respectively, who are on leave.

The Minister for Agriculture (Hon. W. Forgan Smith) has appointed Messrs. R. Swan, A. C. Krieg, B. C. C. Kirkegaard, T. Muir, and J. Archibald to be members of the State Wheat Board as from the 2nd December, 1925, to the 31st August, 1926.

Mr. V. T. Yabsley, of Yandina, has been appointed an officer under and for the purposes of the Animals and Birds Act.

Constables T. J. Appleby, L. L. Johnstone, and D. E. Corey, of Lowood, Urangan, and Dalby, respectively, have been appointed Inspectors of Slaughter-houses.

Mr. J. G. Low, of Winton, has been relieved of duties as part-time Inspector of Slaughter-houses.

Mr. Henry Tryon, Entomologist and Vegetable Pathologist, will be retired from the Public Service as from the 31st December, 1925. Following on his retirement, Mr. Tryon has been appointed temporary Pathologist.

Messrs. J. Munro and W. D. Flitcroft, of Stanthorpe, have been appointed temporary Inspectors under the Diseases in Plants Acts for the Stanthorpe area.

Mr. L. P. Doyle has been appointed Inspector of Stock as from the 4th January, 1926.

Budding of Fruit Trees—Some Hints.

Provided the sap is running freely, budding of either nursery stock or old trees can be carried out this month. Where old trees to be worked were cut back at the end of the winter they should by this time have made plenty of young shoots mature enough to bud into.

The bark of these shoots is not thick, and should offer no difficulty even to the novice, but it is wise to work more shoots than will ultimately be required for the formation of the new tree, as there is likely to be some loss from heavy winds and other causes. Moreover, with thick limbs, if at least two (more are better) shoots are left (one on the top and one on the bottom side), the sap is kept moving on both sides, and there is no chance of the bark dying away on one side. If both are budded, both resultant shoots should be trained in the one direction, so that if one is lost the other will take its place. Two or three years hence, when the callus has crept well over the edges of the top wound where the original thick limb was cut back, one of the budded shoots can be dispensed with. This leaves a wound, but it is one which heals over very much more readily than the top wound referred to above.

Where it is desired, old trees that have not been cut back and have no young shoots low down can be budded direct into the old bark. Owing to the thickness of the bark and the pressure it exerts, it is more difficult to slip in the buds, and the work is slower. As a rule the bark on the lower side of limbs, owing to its more shaded position, will lift more easily than that on the upper side. In the following spring, when the limbs are cut back to start the buds, in the event of a shoot starting on the upper side, it should be checked to prevent it from sapping the shoot from the inserted bud, but it should not be rubbed right off, as it will serve to keep the sap moving on the upper side, and prevent any of the bark dying, as just described. Later it could also be budded and held as a safeguard in case the shoot from the bud inserted in the old bark be blown out or otherwise lost; as in the former case the secondary bud could be cut away after the callus has crept well over the edges of the wound where the old thick main limb was cut back.

Duck-Raising—Some Essentials.

The first essential to successful duck-raising is that cheap feed shall be readily available at all times. The time was when ducks could be made to pay by feeding them on mill offal, pollard, bran, &c., but that was when these foodstuffs were very much cheaper than they are now. Duck farming at present can therefore be regarded as likely to prove unprofitable unless the would-be farmer has command of plenty of cheap food, or at least of sufficient to represent a substantial adjunct to the more expensive foods; in other words, a cheap supply of animal or other concentrated food is essential to success. Kitchen scraps, restaurant refuse, or offal from slaughter-houses are the principal sources; nor should the prospective duck farmer delude himself that green feed, vegetables, and such like will take the place of more concentrated foods.

Again, the idea that ducks will lay anything like the same number of eggs as fowls, or even lay them in payable numbers, should not be entertained, except in the case of Indian Runner ducks, which are too small to be considered table ducks, though small lots are sometimes found profitable.

The prices realised for ducks at certain seasons of the year, especially at Christmas time, are likely to be attractive to the novice, but he is liable to forget that these prices are the result of a scarcity of eggs at another season, anterior by

a few months. Duck farming looks attractive, too, because ducklings can be reared in such a short time, are easier to handle, and require a less expensive plant than is the case with chickens.

The same general principles govern the hatching of duck eggs as those for hen eggs, except that it is advisable to run the incubator at about 1 degree of temperature lower than that necessary for hen eggs; most operators prefer to use the moisture trays when hatching duck eggs.

There is an almost general impression among beginners that ducklings should have access to water, but this is a mistake, and it is the cause of a good deal of trouble, particularly in cold weather. Ducklings are best kept dry while "in the down," *i.e.*, until they have got their adult feathers. Going wet to their camp at night is particularly fatal to young ducklings. While small numbers of ducklings may be successfully reared under almost any conditions, a good deal of shed room is required to rear large numbers successfully. Many duck farmers have bought their experience in this respect very dearly.

Dirt in the Dairy—A Deteriorating Factor.

"From 75 to 80 per cent. of the trouble in connection with second-grade cream in this district comes from the faulty washing of the utensils and separator parts."

So says one of a series of articles (by officers of the Dairy Branch of the New South Wales Department of Agriculture) reviewing what has been achieved by co-operation between dairy instructors, dairy factory managers, and dairy farmers for the advancement of cream quality.

In a number of cases, it is stated, the utensils, &c., are washed reasonably clean, but washing soda has not been used in the water, with the result that a greasy surface remains. This is most noticeable in the case of the discs, which are often hung up to dry, with the result that when the day becomes hot the heat produces a tallowy condition, or a greasy surface on the discs. In the afternoon the separator is assembled, often standing for half an hour or so before being put into action. During that time the smell increases, and when the process of separation begins the milk (passing into the bowl in a warm condition) absorbs the smells, and eventually an inferior cream results, which is often separated into a greasy tallowy-smelling benzine tin.

Then, again, in washing the separator parts, a cloth is more often used than a brush. This cloth, after being used, is frequently left in a wet heap on the bench inside of the wash-up vat, where it remains until it is required at the next washing. It very rarely dries properly, and being a cotton fabric it readily absorbs bad smells, and goes musty, rancid, and putrid, and imparts to all the utensils, separator parts, and water a smell sufficient to turn any cream. This is one of the most common sources of trouble met with.

The vat tap and connecting pipe are two places that are also frequently sources of high contamination, for if they are not taken to pieces after each use and thoroughly washed and brushed out, milk accumulates and decomposes, with injurious results. The case is quoted of a farm the cream from which was constantly graded second quality. Upon inspection the dairy and bails were found to be in a splendidly clean condition, but on examination of the vat tap it was found that it had been soldered on, and there was a cavity of about half an inch on the inside of the soldered joint which was filled with decomposed milk of a putrid nature. The vat tap was renewed, and the trouble cleared up.

Milking machines have given considerable trouble on account of both improper cleansing of the milk system and neglect to properly wash the vacuum system.

In connection with the cleansing of the milk system, the biggest trouble has come through the teat cups and rubbers. Very often the rubbers are used until they are in a perished state before there is any thought on the part of the farmer of renewing them. After instruction has been given in methods of washing, the farmer is always strongly advised to keep the rubbers in a clean solution of lime water. This keeps them sweet and greatly diminishes the rubber taint.

Neglect and oversight in keeping the vacuum tank sweet, says the article, have in more than one case been the cause of second-grade cream, a very striking illustration being afforded by a well-known estate. For a considerable period cream supplied by the estate to the local factory had been constantly graded second-class by the factory certificated grader. The manager of the estate had done his best to find the cause of the trouble, but could not, and he asked that an officer of the Department be sent out. As a result of the investigations made by the Dairy Branch staff, the dairy premises were found to be well kept, but the vacuum tank was found to be in a shockingly filthy state, being half filled with a decomposed milky substance, the smell of which was tremendous.

Samples of this decomposed substance were forwarded to the Department's Biological Branch, together with the connecting rubber tube from the vacuum tank to the distributor, the report on the putrid material showing that the addition of one drop to milk or cream would cause, in the course of twenty-four hours, objectionable flavours. The tube, too, was shown to be a potential cause of serious contamination.

The whole of the plant was dismantled and thoroughly cleaned, taking three days to properly sweeten, since when the cream had graded choicest quality, and no further trouble had been experienced.

Grazing Lucerne—Some Points to Remember.

In dry districts the value of lucerne as a grazing crop commends itself to stockowners. Being very drought-resistant, it often provides acceptable green feed when other succulent fodder is scarce or non-existent, and after a long, dry spell it is almost an axiom that lucerne is the first plant to grow when rain comes.

The pasturing of stock upon lucerne, however, is attended by two risks—one to the plants and one to the stock.

Lucerne should not be pastured during the first or second season of its growth, as the plants are not then sufficiently strong to withstand the inevitable trampling. Again, it will not stand continual grazing at any time; and the method should be to put sufficient stock on to eat it down quickly, and then to move them off before the young plants have commenced to shoot. The paddock should be subdivided into small lots for grazing, so that the stock can be moved from one to the other in quick succession. Temporary fences should be erected and shifted as required. This prevents injury to the plants and reduces the loss of feed.

Even with reasonable care the use of lucerne as a pasture will inevitably lessen the life of the plants. Lucerne not irrigated and fed off by stock in the drier districts will probably require to be sown after a very short period—perhaps as short as four years. Whenever possible, a cut for hay or green feed should be taken.

While grazing is permissible on the higher lands, it should never be practised on rich alluvial flats. It will inevitably result in the lucerne being thinned out, and with the further result that not only will the yield be reduced, but the hay will be of a coarse, rough quality, possibly full of weeds.

''Bloat,'' or hoven, is caused by feeding stock upon green, succulent fodder at a time when the stomach is practically empty, or by giving an abundance of gas-producing food before the digestive organs of the animal have been accustomed to dealing with such material. Cattle and sheep appear to be the only domestic animals subject to the danger. If the lucerne is wet at the time of eating, the liability to bloat is increased, and the danger is especially great when the crop is in the early stages of growth.

In the drier districts there is not as great danger of bloat as on rich alluvial flats, for the simple reason that there is not the same abundance of succulent fodder.

Stock should not be put on lucerne when it is wet. The danger is accentuated in humid and windy weather. If possible the animals should go on with a full stomach. They should first have their appetite appeased with grass, green maize, sorghum, or other similar food. Bloating usually occurs when hungry animals are put on the feed and eat large quantities, and it also occurs if they are put on and taken off for periods. They should be kept on continuously and never allowed to get hungry.

If the stock cannot be placed in the paddocks with full stomachs they should be taken on and herded for twenty minutes or so, and then taken off for about an hour, and put on for another twenty minutes, and the process repeated until the stock are no longer hungry. This practice is recommended whenever stock are being introduced to lucerne after other feeding. When they have become accustomed to the feed they can be left alone.—A. and P. Notes, New South Wales Department of Agriculture.

How Fallowing Removes Risks.

Fallowing removes risks, points out a farming paper, in the following ways:—

1. By insuring that the crop can be sown at the correct time.
2. By conserving moisture in the soil to augment any rain that may fall during the time the crop is growing.
3. By destroying weeds, such as wild oats, &c.
4. By destroying the spores of diseases, such as take-all.
5. By increasing the amount of available plant-food.
6. By sweetening the soil, and generally putting it into a condition that will promote vigorous growth.

Journal Appreciated.

The Editor has received many complimentary and appreciative letters on the Journal and its contents from country correspondents and readers in other States, New Zealand, and overseas, and which are gratefully acknowledged.

Proposed Honey Pool.

Referendum papers to decide whether or not a Honey Pool for the whole State shall be created have been despatched to those concerned.

The pool, if formed, will be for two years, and will apply to all beekeepers who have at least four hives and market the honey therefrom.

The following nominations have been received for the Board to administer the pool, if formed:—

Brown, Alexander Roy, Blythdale,
Dennis, Isaac James, Loganlea,
Gruhl, Herman Reinhold David, Pittsworth,
Peake, Matthew, The Gap,
Pickering, Edward, Eumundi,
Rosser, John Hall, Molendinar,
Simpson, John James, Buderim Mountain,
Spry, Augustus Frederick, Brisbane, and
Woodrow, Robert Victor, Woodford.

The ballot papers for the Board are also being sent with the referendum papers.

Both referendum and ballot papers are returnable at noon on the 11th January, 1926.

If any beekeeper concerned does not receive his paper, he should apply at once to the Under Secretary, Department of Agriculture and Stock, Brisbane, for same.

Egg Pool.

The counting of votes in connection with the Egg Pool referendum and ballot took place on the 4th January, under the supervision of Mr. M. L. Cameron, of the Department of Agriculture and Stock. Two postal votes were taken, one on the question whether there should be an Egg Pool in respect of the owners of fifty fowls and over, and one on the question of a Pool for the owners of 100 fowls and over, the owners of the latter number of fowls having a vote in both ballots.

The counting of the papers for the creation of a Pool embracing owners of fifty fowls and over was carried out first, and resulted as follows:—

For the making of an order for the Pool	939
Against the making of an order for the Pool	464
Majority for the making of an order	475
Informal	31

The necessary two-thirds majority has, therefore, been obtained.

The votes for the Board members for Nos. 1 and 3 Districts were also counted, with the following results:—

No. 1 District (comprising the petty sessions districts of Bundaberg, Gin Gin, Mount Perry, Eidsvold, Childers, Maryborough, Biggenden, Gayndah, Tinana, Gympie, Kilkivan, Wienholt, Nanango, Maroochy, Caboolture, Woodford, and Kilcoy)—

A. Moody (of Palmwoods)	104
A. Hunter (of Woombye)	83

No. 3 District (comprising the petty sessions districts of Wynnum and Cleveland and of that portion of Brisbane south of the Brisbane River)—

S. Luxford (of Wynnum)	65
M. H. Campbell (of Albany Creek)	57

Although it was not necessary to do so, the ballot papers in respect of the other proposed Pool for owners of 100 fowls and over were counted, and resulted as follows:—

For the making of an order for a Pool	500
Against the making of an order for a Pool	135
Majority for the making of an order	365
Informal	7

Cut Out the Waste.

Hawaiian pineapple growers have developed their industry to the stage where not a fraction of the fruit is wasted. The parts not suitable for regular commercial packs of canned pineapples are used as by-products, while the trimmings, cores, ends, and shells all go to sugar-mills, the juice being extracted and converted into sugar, citric acid, alcohol, carbon dioxide, and vinegar. The final residue is converted into stock feed.

Marketing of Stone Fruit.

Large consignments of stone fruit are now coming forward. To secure a good demand every attention should be paid to sizing, grading, and packing. The fruit should be picked when firm, but properly matured. Growers would do well to keep in mind the fact that some time elapses between the time the fruit leaves the orchard and the time it reaches the consumer, and if it is over-mature when it sets out it has little chance of reaching the market in anything like good condition. Stone fruits which are overripe or bruised cannot be sold at prices satisfactory to the grower. It is important to ensure when packing for market that cases are not packed too high or fruit forcibly squeezed into its place. Care in handling is of paramount importance, as in order to keep the fruit in proper condition it is absolutely necessary to see that its skin is kept intact.

Pasture Improvement.

Up to the present, points out a Crookwell (N.S.W.) farmer in an Agricultural Bureau paper, the sheep men of Australia have been content to ringbark, sucker, pick up and burn, and to conserve water, but the idea of supplanting the natural grasses with more succulent and heavier-carrying grasses and clovers has not received serious consideration. Improvement of pastures means not only two or three times the present carrying capacity, but also that the sheep will be well fed, and instead of the farmer struggling through with about one indifferently fed sheep per acre, he will carry two or three times that number of well-nourished animals. This means bigger sheep, heavier weight of wool—certainly not so high-yielding, but more money per head—a bigger percentage of lambs, and (perhaps one of the main assets) fat lambs.

It is the idea of most people on the land, as soon as they make sufficient money from their holding, to launch out and buy more land. What the farmer should do is to put the money he has made out of his land back into it and improve his pastures.

Standover Cotton.

The Minister for Agriculture (Hon. W. Forgan Smith) stated recently that it had been brought to his notice that considerable areas of standover cotton are to be found in certain parts of the State, particularly in the Central District. So far as can be gathered, these areas are all situated on newly burned scrub lands, from which a crop was harvested last year but which have become overgrown with weeds.

It is impossible obviously for the farmers to compete with the weeds in these large areas, since horse cultivation is prohibited by the presence of the stumps remaining in the land, and hand hoeing is impossible on any considerable scale on account of the expense incurred. Nevertheless, it is necessary to point out that the existence of these large areas of standover cotton is not in accordance with the provisions of the Cotton Industry Act, and steps must be taken to destroy them.

Standover cotton is a standing menace from the point of view of the spread of insect pests, since the insects are able to find harbourage in these plots throughout the winter and carry over in increasing numbers from one season to another. This is especially the case with the Pink Boll Worm, which is present in the Central district, and is one of the worst and most dreaded enemies of the cotton plant. In many cases these standover plots are so overgrown with weeds and grass that it should be easy to clean them up by burning the paddock at this time of the year.

For the future, scrub farmers who are planting large areas on newly burned country this season would be well advised to consider the following suggestion:—In March the cotton plants have become well established and are in full boll, and at this time Rhodes grass seed should be scattered over the paddock. Grass seed will germinate on the last of the March rains and will become established without interfering unduly with the growth of the cotton plants. After the cotton has been picked the Rhodes grass will produce a big growth of leaf and could be burned at the end of the winter at the same time as the old cotton bushes, and incidentally insects that they harbour would be destroyed. Most of the cotton-growers in this belt are dairy farmers, and their ultimate object in any case is to establish paddocks of Rhodes grass on newly burned scrub.

Calico for Fumigation Sheets.

The material from which the tents or sheets used in the fumigation of citrus trees are made should be a closely woven strong calico, one which will not show open patches when held to the light. A pocket lens is useful for examining a calico, which should show a uniform weave when inspected through the glass. The material may also be tested by holding it over one's mouth and trying to blow through it. Care should be taken to see that the calico does not only appear to be closely woven through carrying some dressing.

Poisoning Among Poultry—Common Causes.

The most common causes of poisoning among poultry are ptomaines, toxins, and common salt. The sypmtoms in each of these cases are much alike, so much so, that probably the layman would not be able to make a correct diagnosis; but investigation into the methods of feeding, and an examination of the foods fed, will generally lead to the right solution.

The symptoms present are those generally accompanying gastritis and enteritis. The fowl becomes droopy, refuses food, and digestion becomes arrested. The last condition can be detected by the fact that the crop will often contain food for days together, although the bird is not eating. Diarrhœa is usually present. There may be a large number of deaths or a very few, according to the severity of the trouble; usually comparatively few deaths occur, but most of the birds will be so affected as to put them in a precarious state of health for some considerable time, in consequence of which they will go off laying.

Ptomaine poisoning arises from putrefaction of various kinds of albuminous matter, and toxins are formed by pathogenic bacteria. The danger to poultry arises from cooked meat, meat meals, or blood meals. The chief danger is from cooked offal that has been allowed to ferment, as it will do if left to stand after cooling. The same thing may come about through careless handling in the preparation of meat or blood meal, but toxins may also be formed in well-prepared meals if they are allowed to get damp.

It should be understood that no amount of cooking is of any use to get rid of these poisonous substances once they have been formed. This is where the poultry farmer is often found making a mistake, in thinking that all deleterious matter is rendered innocuous by cooking.

There appears to be no useful practical antidote to this class of poisoning in poultry; the only thing to do is to stop feeding the suspected articles and treat as for diarrhœa.

In the case of poisoning by common salt the trouble arises not from a moderate use of salt, which is very necessary, but from its excessive use, or where it has been imperfectly mixed with the food; hence the advice that salt should be dissolved in the water with which food is mixed. When undissolved salt, even though in very small particles, comes in direct contact with the crop of the bird it acts much in the same way as a corrosive poison, destroying the lining membrane.

When salt poisoning is suspected, its use should be discontinued for a few days.—A. and P. Notes, N.S.W. Dept. Agr.

Dehorning Cattle.

The object of dehorning is to prevent cattle from injuring one another. Such injuries in a dairy herd not infrequently involve the udder, the flanks, and other parts, and the wounds made, especially when the udder is involved, may have a serious effect on the health of the animal. Among beef cattle considerable bruising is caused when the cattle are *en route* to the killing works, especially if they are travelling by rail. Besides the injury there is, of course, a considerable amount of pain inflicted at times on one animal by another.

In order to prevent injury, pain, and bruising, the practice of dehorning is being widely carried out in New Zealand and other countries, states a New South Wales departmental circular advocating the practice to members of the Agricultural Bureau. When performed on calves the operation is very simple, and certainly not as painful as castration, speying, or docking. It is while the animal is young that the operation is best carried out.

The method recommended is surgical, the instruments required being a sharp knife, a pair of claw forceps, and a pair of curved scissors. The calf is held in a steady position by an assistant. The bud is felt and the surrounding hair removed, leaving a clear field. The bud is then raised until the overlying skin is tense, using the thumb and forefinger, and an incision made with a sharp, clean knife over the centre of the bud, which is grasped with the forceps and pulled through the incision sufficiently far to allow the curved scissors to be inserted underneath, and clipped off.

No after treatment is required, but if the weather is hot or the wound appears dirty, a wash with a weak solution of any disinfectant should be given.

By the second method the hair is clipped off the skin overlying the buds, the parts washed with water, and caustic rubbed over the buds. The precaution must be taken to see that the whole of the bud, including its extreme edges, are so treated, otherwise small horns may grow. Wet weather should be avoided, or the strength of the caustic will be weakened.

The most suitable time for the operation is during cool weather, when no flies are about. Cows should be dehorned when the milking period is over or drawing to an end and before they are many months in calf. When the animal is young and the horns are green, it is best to use a pair of sharp, clean shears. In older animals, especially where the horns have a broad base, a sharp bone saw should be used. This obviates the risk of fracture of the frontal bones of the head, which is common when the horn is very solid or when the shears are blunt.

When a number of cattle are being dehorned, alteration to the breast bars of a race, one bar having a U-shaped notch in the centre big enough to accommodate the windpipe and gullet, is of advantage. Having the animal secured, grasp the horn with the left hand, and after selecting the part where the dehorning is to take place, commence sawing gently until a track has been made for the saw. Then saw quickly, but do not exert pressure downwards on the horn more than just enough to relieve the saw, as it is desirable to have a clean underneath cut. The other horn is similarly treated.

The correct distance from the head for taking off the horn is 1½ inches. If cut shorter than this the frontal sinuses of the head are exposed, while if cut longer the animal still retains weapons of offence. Any case of excessive bleeding should be attended to by the application of tar. After-treatment is seldom required, except in hot weather.

Primary Producers' Organisation.

His Excellency the Lieutenant-Governor (Hon. W. Lennon) has approved of a new regulation under the Primary Producers' Organisation Acts providing that the first Annual Sugar Industry Conference shall be convened by the President of the Council of Agriculture not later than the 6th February, 1926. As a result of this regulation, the Hon. W. Forgan Smith, President of the Council of Agriculture, has issued a notice convening the following meetings:—

The first Annual Sugar Industry Conference will be held in the Boys' School, Mackay, on Wednesday, the 20th January, 1926, at 10 a.m.

The first meeting of the Queensland Canegrowers will be held in the Boys' School, Mackay, on Wednesday, 20th January, 1926, at 2 p.m.

The first meetings of the District Executives of the Cairns, Innisfail, Herbert River, Ayr, Proserpine, and Mackay districts will be held in the Boys' School, Mackay, at 10 a.m. on Tuesday, 19th January, 1926.

The first meetings of the District Executives of the Bundaberg, Maryborough, and Southern districts will be held on Tuesday, 19th January, 1926, at 7 p.m., in the Boys' School, Mackay.

Meetings of District Councils of Agriculture.

The Minister for Agriculture and Stock (Hon. W. Forgan Smith), President of the Council of Agriculture, has issued a notice convening the first meetings of the District Councils, which shall be held on the dates and at the places respectively set opposite each, as follows:—

Name of District Council.	Date of Meeting.	Place of Meeting.	Hour of Meeting.
Central Queensland ..	Friday, 29th January	Rockhampton ..	10·30 a.m.
The Burnett	Thursday, 28th „	Maryborough ..	10·30 a.m.
South Burnett	Monday, 25th „	Kingaroy ..	11·0 a.m.
Wide Bay	Wednesday, 27th „	Gympie ..	1·30 p.m.
East Moreton	Friday, 29th „	Brisbane ..	1·30 p.m.
West Moreton	Friday, 29th „	Ipswich ..	11·30 a.m.
The Darling Downs ..	Wednesday, 27th „	Toowoomba ..	11·0 a.m.
The Western Downs ..	Wednesday, 27th „	Chinchilla ..	10·30 a.m.

The Feathered Friends of Man.

"The service that birds perform in protecting woodland trees," writes E. H. Forbush, State Entomologist of Massachuetts, "is more nearly indispensable to man than any other benefit they confer on him. . . . Were the natural enemies of forest insects annihilated, every tree in our woods would be threatened with destruction, and man would be powerless to prevent the calamity.

"He might make shift to save some orchard or shade trees; he might find means to raise some garden crops; but the protection of all the trees in all the woods would be beyond his powers. Yet this herculean task ordinarily is accomplished as a matter of course by birds and other insectivorous creatures, without trouble or expense to man, and without appreciable injury to his great woodland interests."

A Martyr to Science.

Referring to the untimely death of Professor Harold Maxwell Lefroy, a cable announcement of which appeared some weeks ago, the London "Daily Telegraph" says that in the records of heroic sacrifice and achievement, not the least honourable place must be given to men of science who, like Professor Lefroy, count personal safety as nought in the dangerous quests to which they dedicate themselves for the advancement of knowledge and the deliverance of mankind. In the light of such examples, who can gainsay that peace hath her victories not less renowned than war? And it is surely an encouragement to think nobly of the soul to know that men and women can, in ardent and unquenchable thirst for knowledge, cheerfully and deliberately put aside all that, for most of us, makes life most worth living. In many of those high deeds that not unworthily win the world's applause there is the support of a mood of exaltation and the sense of an immediately challenging crisis. It adds:—"Surely the time has come when some badge of honour should be devised and dedicated to men of science who risk so ungrudgingly life and health in extending 'the bound of human thought.' The Victoria Cross and the Albert Medal should have a counterpart to be reserved for the heroes of pure research."

The Wisdom of Solomon.

How clearly Solomon understood the value of intelligence as a factor in successful farming, for he says in Proverbs: "I went by the field of the slothful, and by the vineyard of the man void of understanding, and lo, it was all grown over with thorns, and nettles had covered the face thereof, and the stone wall thereof was broken down."

An Interesting Parchment.

The Government Botanist (Mr. C. T. White) received recently from Mr. W. L. Osborne, of Wondai, an interesting sample of a vegetable parchment. In a letter Mr. Osborne pointed out that quite a lot of material similar to the sample was taken from the centre of a bloodwood log about 3 ft. in diameter. The tree was green, and was felled and split into palings, the material being found encircling the heart of the tree. The heart was about 6 in. in diameter, and the space between it and the valuable wood of the tree was occupied by the parchment. Mr. Osborne said that he had exhibited samples at several country shows, and a piece had been taken to the old country. Mr. White stated last week that the specimen sent proved to be a fungus, of which only the roots were known, and had been given the name of *xylostroma giganteum*. It had been suggested that it was really only the roots of another fungus, *polporus eucalyptorum*, one of those large bracket fungi often seen on the sides of trees. This fungus usually attacked trees like the bloodwood as the roots travelled between the gum veins. In addition to those from the bloodwood he had received specimens taken from the coolibar.—"The Queenslander."

Making Cream Cheese.

The best method of making cream cheese is to place a quantity of fairly thick cream in fine textured linen cloth. Tie up the cloth bag fashion by taking the four corners and fastening with a piece of string, then hang up to drain in a draughty place. Twice daily, or more often if convenient, open out the cloth, and with a knife scrape down the hardened cream from the outside, and mix with that of softer consistency from the centre. This is repeated for two days, or less if the scraping down occurs frequently, until the cream is of a firm but pasty consistency. Turn the drained cream out into a basin, and thoroughly mix in a small quantity of salt. Cheese moulds can be obtained in various shapes, squares, oblong, or round. The mould is lined with a piece of grease-proof paper or butter muslin, into which the cheese is filled. After wrapping over the paper or muslin, the weighted lid is placed on top, and pressure is momentarily applied, when the shaped cheese is turned out, says an English farm paper.—"The Queenslander."

The Art of Agriculture.

Agriculture is an art, and it is an art that was practised centuries before the sciences were born with which it has become associated in modern times. Nevertheless, the farmer of to-day, working under modern conditions, cannot afford to neglect the teachings of science as far as they affect his own art; and that farmer will be the successful one who is able to understand what science has to tell him, and to utilise the weapons which she puts into his hands.—"Agricultural Gazette" of New South Wales.

Agricultural Education and Research in Britain.

The development of facilities for agricultural education and of equipment for agricultural research has been very great since the war. There are now fifteen universities, university colleges, and agricultural colleges at which higher education in agriculture is provided with the assistance of grants from the Exchequer amounting to £48,000. Capital grants have also been made to these institutions, usually on a "£ to £" basis, amounting to about £100,000. There are also fourteen farm institutes in England and Wales, at each of which courses, in some cases extending over one or two years, but usually of shorter duration, in general agriculture, horticulture, dairying, and poultry-keeping are given. Under the Corn Production Acts (Repeal) Act, 1921, one of the purposes to which the funds thereby authorised were to be applied was "the establishment of scholarships and maintenance grants for sons and daughters of agricultural workmen and others." During the past three years 350 scholarships have been awarded under this scheme. The parents of the students were in 80 cases agricultural workers, and in 81 other cases small holders. Altogether, it appears from the report recently issued by the Minister of Agriculture that over 10,000 students are now receiving agricultural education at the charge, either wholly or partly, of public funds. The recognition of the obligation of the State in regard to the endowment of agricultural research is of comparatively recent origin. The work carried on for so many years at Rothamsted and Woburn by private resources has been in a large measure taken over, and greatly developed, by the expenditure of public funds. Research in various branches of science relating to agriculture is conducted at twenty-three institutions in various parts of the country.

Fruit Syrup Making in China.

Fruit syrup is increasingly popular among the Chinese as a cold summer drink. Formerly, only imported syrups could be obtained; but now six companies in Shanghai are engaged in the manufacture. Fruit syrup does not involve many complications in manufacture. The process employed by local manufacturers generally consists of boiling the fruit in sanitary boilers, thereby extracting the liquid. With the addition of sugar and alcohol, the syrup is ready for sale after bottling. The quality of the syrup depends upon the fruit employed. The fruit must be fresh and the syrup must not be extracted in too great a quantity, or there will be sediment at the bottom of the bottles, so reducing the quality.

Chinese use fruit syrups in two forms. First, they are taken as a cold drink. For this one part of fruit syrup is mixed with ten parts of cold boiled water. This form of drink is popular in Shanghai because of the very many varieties of syrups to be had, and in the interior because in many places aerated waters are not available. Secondly, the syrup is very often mixed with Chinese kaoliang and other kinds of wine. Kaoliang wine is colourless, but with fruit syrup it turns into a brilliant colour. Bottles of fruit syrup are often given as presents to relatives and friends on festival days.

There are about twenty-one kinds of syrup sold by the Talow Canning Factory in Shanghai. They are lemon, almond, strawberry, peach, loquat, pear, banana, orange, apricot, cherry, mulberry, peppermint, apple, pineapple, grape, rose, olea fragrans, tender ginger shoots, sarsaparilla, bergamot, and aromatic grasses. Other manufacturers produce only from six to eight of the more common varieties. Fruit syrup is put up in bottles of approximately 28, 14, and 7 liquid ounces. Some manufacturers use only the large and medium sizes. The large bottle will make approximately twenty cups of cold drink.

The oldest manufacturer of fruit syrup in Shanghai is the Tai Foong Canned Goods Co., Ltd., which also cans fruits, meat, and vegetables, and also makes biscuits. This company produces eight varieties of the more common kinds like banana, lemon, orange, &c. The present retail price of these syrups is large bottle, 55 cents; medium bottle, 30 cents. (At the present rate of exchange the dollar is equivalent to approximately 2s. 1d.)

Answers to Correspondents.

"Ragwort" (*Senecio lautus*).

E.A.F. (Tara)—

The Government Botanist (Mr. C. T. White, F.L.S.) advises that the specimen is *Senecio lautus*, a species of "Ragwort." It is a native plant that occasionally overruns brigalow country to the exclusion of grasses and herbage, and in this respect is likely to become a pest. It is very abundant in parts of Central Queensland. It is not known to be poisonous, but seems to be rarely if ever touched by stock.

Cow Pox—Sun Scald.

"QUERIST" (Nanango)—Mr. Veterinary Surgeon A. McGown advises:—

1. The affected teats should be cleansed thoroughly with warm water, and when dry the affected parts should be treated with zinc ointment. Great care should be taken in the milking so as to prevent further cracking of the skin. All affected cattle should be isolated and they should be the last to be milked at each milking. The hands of the milker should be washed thoroughly in disinfectant solution after each milking.

2. The trouble supposed to be due to sun scald is most commonly found in white animals. When first noticed the animal should be placed in some shelter out of the sun. The affected part should be anointed with vaseline. Continue the treatment until the affection disappears.

Ipomopsis—Plant Identified.

E.G.J. (Brisbane)—The Government Botanist (Mr. C. T. White, F.L.S.) advises:—

The specimens sent with your letter of the 9th instant, *Ipomopsis elegans* (synonym *Gilia coronopifolia*), is a native of the warmer parts of North America. It is recorded as a biennial, but in Queensland is usually treated as an annual. It makes a great show in the garden and is not grown to the extent it deserves. It is generally listed by seedsmen as Ipomopsis. Seeds sown in autumn or winter flower in early summer.

Poland-China Pigs—Sow Eating Her Young.

A.J.L. (Coolabunia)—

At present there appears to be a great scarcity of Poland-China stock, and Mr. Shelton (Instructor in Pig Raising) doubts very much whether you will be able to secure a sow at the age desired in this State. We are trying to secure particulars of suitable sows in New South Wales. It will, of course, cost more to secure a sow in pig, though if you were fortunate enough to have the sow farrow safely a few weeks after purchase, her price would soon be made up.

Re the loss of Poland sow's litter through cannibalism—Mr. Shelton says that sows sometimes develop this pecular characteristic, and it is an indication that the sow's ration has not been balanced properly. She has probably become over-fat and has had an over-supply of milk and corn and not sufficient green lucerne or other flesh-feeding foods, the absence of which sets up a craving which is apparently temporarily relieved by the sow devouring her young. It does not follow that the sow is likely to indulge in this same practice with future litters, but especial care and attention should be paid to seeing that she is kept in medium breeding condition only, that she has liberal supplies of green food, that she is compelled to take exercise freely, that her bowels are in good order and condition, and that she is not suffering from constipation or other bowel troubles.

It is reputed that a good cure for a sow that shows an inclination to eat her young is to give her several slices of salt (pickled) pork or some fat bacon, the salt apparently having the effect of satisfying the craving and thus overcoming any further loss. Nevertheless, the sow showing these tendencies should be separated from her litter, temporarily, at any rate, and the young pigs should only be allowed to suckle when an attendant is present. After suckling they should be removed to a separate sty right away from the sow until meal time comes round again. Cannibalism is an unnatural tendency, and is invariably the result of improper feeding. It is not desirable, however, to retain for breeding purposes any of the progeny of such a sow.

T.H.W. (Nambour)—Mr. Shelton advises:—

Do not allow the Poland-China sow to get too fat. Special attention will be necessary, and you must keep the green food up to her, even though she may show an inclination to go on strike. Hunger soon overcomes this tendency. As the sow is so accustomed to the sty, it should not be necessary to shut her up at all until a day or two before due date. Meantime, see that her bowels are in good order and that she does not suffer from constipation. About three days before due date give her a three tablespoonful dose of castor oil. Mix the oil in a small quantity of dry meal or bran, then thin the mixture down to the consistency of cream by adding skim milk. Just enough salt should be added to slightly flavour the mixture, say half a teaspoonful or less in the ordinary supply of food. Salt acts as a poison if used too freely in the food supplied to pigs, hence special care is necessary in using same.

You will be able to determine when the sow is likely to farrow by noting her udders. Milk will show on the point of the teats about twelve to twenty-four hours before farrowing, and by gently squeezing the teats a stream of milk will be noted. A few hours before the birth of the pigs the sow will be anxious to get together a quantity of grass or bedding to make a bed for herself. As the young pigs will be of great value to you, it pays to watch her closely, and if need be to do some overtime by being present if she farrows at night, for it is quite possible she may become rather excited over the event and may have an accident with one or other of the young ones. If she is too restless it is better to remove the young pigs, and keep them in a box in which some grass or straw is placed, and when she finally quietens down allow the young ones to suckle. It sometimes pays to follow this practice for a day or two if the sow is at all clumsy. All this may seem a lot of trouble, but as these young pigs will be worth from 4 to 6 guineas each as weaners it will pay to give the sow more attention than would be the case on most farms. The main point to be observed is that the sow must not be forced with food at farrowing time. Keep her on a very light diet until the young ones grow up a bit and can take all the milk she makes.

A PLANT SUSPECTED POISONOUS TO STOCK.

Mr. W. Dixon, Stock Inspector, Wondai, writes:—

"Under separate cover I send you a sample of a weed which grows luxuriantly on a cultivated land on the holding of Mr. P. Campbell, Tingoora.

"Mr. Campbell lost a number of milch cows recently under circumstances which pointed to vegetable poisoning, and it is thought that the weed in question might be the cause.

"I would be glad, therefore, if you would tell me if you have any knowledge of this weed being injurious to live stock.

"Thanking you in anticipation."

The specimen was referred to the Government Botanist (Mr. C. T. White), who reported as follows:—

"The specimen forwarded for identification and report is *Crotalaria incana*, a species of 'Rattle pod' or 'Rattle box.' The local name is derived from the fact that the seeds rattle in the pod when dry.

"This particular species has not previously come under suspicion, but various other species of Crotalaria or 'Rattle pod,' both in Australia and abroad, have been definitely proved poisonous to stock; therefore, your correspondent's suspicions regarding the plant have probably good foundation."

Farm Notes for February.

Reference was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

The excellent rains recently experienced should have a heartening effect on all farming operations, as a good season may now be reasonably expected.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River), wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production. Weather conditions, particularly the recent heavy and continuous rains, have interfered a great deal with farming operations. Although abundant supplies of grasses are in evidence, provision should be made for the inevitable period, at maturity, when these lose their succulence.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description suitable for coastal districts and localities, where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth, which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of one pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds should be kept in check among growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances, to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

Orchard Notes for February.

THE COASTAL DISTRICTS.

February in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot as it will thereby prevent the soil from washing, and where the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become ''winey,'' while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4¼ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be alllowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Where there are facilities for cyaniding, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early-ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertiliser, as strawberries require plenty of food and pay well for extra care and attention.

GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of peaches and plums, and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months, with regard to handling, grading, packing, and marketing, is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

CUTWORMS.

The Commonwealth Cotton Entomologist (Mr. E. Ballard, F.E.S.), associated with the Cotton Branch, Department of Agriculture and Stock, Queensland, advises that several complaints have been received from different cotton areas of damage done to cotton seedlings by grubs commonly known as cutworms. Leaves are eaten, and sometimes the seedlings are cut down at about the level of the ground.

These cutworms are the caterpillar stage of a moth (*Agrotis* sp.). They only feed at night, and hide during the day under the surface of the soil or under clods of earth. The grubs are about 1¼ inches long when full grown and of a dirty grey-green colour.

The usual remedy for controlling them is to scatter a poisoned bait around the plants. This bait is made as follows:—Bran, 25 lb.; calcium arsenate, lead arsenate, powder, or Paris green, 1 lb.

Mix the bran and Paris green together, then moisten with water and molasses. The bait when mixed should not be too wet, but should just crumble in the fingers. It should be spread at night, or just before dark, at the rate of about 5 lb. to the acre.

The cutworms will feed on the bait, which will not kill them at once, but after a dose of the poison they will not feed again.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. K. CHAPMAN.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1926.	January.		February.		Moonrise. Jan.	Moonrise. Feb.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·1	6·48	5·25	6·45	8·30	8·54
2	5·2	6·49	5·26	6·45	9·6	9·27
3	5·3	6·49	5·27	6·44	9·44	9·59
4	5·3	6·49	5·28	6·43	10·16	10·33
5	5·4	6·49	5·29	6·42	10·55	11·9
6	5·5	6·50	5·30	6·42	11·25	11·49
7	5·5	6·50	5·30	6·41	12·0	nil
8	5·6	6·50	5·31	6·40	nil	a.m. 12·32
9	5·6	6·50	5·32	6·39	a.m. 12·36	1·24
10	5·7	6·50	5·33	6·38	1·14	2·21
11	5·8	6·50	5·33	6·38	1·57	3·24
12	5·9	6·50	5·34	6·37	2·45	4·32
13	5·10	6·50	5·35	6·37	3·41	5·41
14	5·11	6·50	5·36	6·36	4·43	6·49
15	5·12	6·50	5·36	6·35	5·47	7·56
16	5·12	6·50	5·37	6·34	6·58	9·0
17	5·13	6·50	5·38	6·34	8·7	10·2
18	5·14	6·49	5·38	6·33	9·13	11·3
19	5·15	6·49	5·39	6·32	10·15	12·0
20	5·16	6·49	5·40	6·31	11·14	p.m. 12·52
21	5·16	6·49	5·40	6·31	p.m. 12·14	1·53
22	5·17	6·49	5·41	6·30	1·12	2·46
23	5·18	6·48	5·41	6·29	2·8	3·37
24	5·19	6·48	5·42	6·28	3·3	4·22
25	5·20	6·48	5·42	6·27	3·58	5·4
26	5·20	6·47	5·43	6·26	4·49	5·41
27	5·21	6·47	5·44	6·25	5·38	6·21
28	5·22	6·46	5·55	6·24	6·25	7·5
29	5·23	6·46	...	...	7·6	...
30	5·24	6·45	...	...	7·45	...
31	5·25	6·45	...	...	8·20	...

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

7 Jan.	☾ Last Quarter	5 22 p.m.
14 ,,	● New Moon	4 35 p.m.
21 ,,	☽ First Quarter	8 31 a.m.
29 ,,	○ Full Moon	7 35 a.m.

Apogee, 2nd January, at 8 36 p.m.
Perigee, 15th January, at 9 36 a.m.
Apogee, 30th January, at 2 24 a.m.

About two hours before sunset on the 14th instant, the sun will undergo a total eclipse, when viewed from parts of the world a good deal to the north and west of Australia. From a portion of Queensland north of Townsville, and of Perth, in Western Australia, a glimpse of a partial eclipse of the sun will be obtained, but for the rest of Australia no difference in the ordinary appearance of the sun will be observable.

The nearest approach of the earth to the sun will occur on the 2nd instant, at 2 p.m. On the following day Venus will attain its greatest brilliancy. Saturn will be in conjunction with the moon on the 10th, at 12·47 p.m., when it will be 2 degrees 47 seconds south of that luminary. Jupiter will be lost to view this month on account of its being in conjunction with the sun on the 25th. The Southern Cross will be below the horizon in Queensland until about 10 p.m., in the early part of the month, but becoming visible earlier as the days proceed. It will be lying on one side about 30 degrees eastward of the southern meridian, at first about midnight but later in the month nearer 11 p.m.

6 Feb.	☾ Last Quarter	9 25 p.m.
13 ,,	● New Moon	3 20 a.m.
19 ,,	☽ First Quarter	10 36 p.m.
28 ,,	○ Full Moon	2 51 a.m.

Perigee, 12th February, at 10 24 p.m.
Apogee, 26th February, at 3 12 a.m.

As Venus will be in inferior conjunction with the sun—that is, nearly in a straight line with it—on the 7th, when its dark side only will be presented toward the earth, it will be lost to sight for the greater part of this month. On the 15th Mercury will be in superior conjunction with the sun—that is, on the far side of its orbit and apparently so close to the sun as to be invisible. An interesting occultation of the star delta Geminorum, a star of magnitude 3·5, will occur on the 23rd. With a pair of binoculars or small telescope the star should be seen on the east side of the moon, which will approach the star and suddenly occult it shortly after 7 p.m., before the bright edge of the moon has quite reached it. About an hour later, in Southern Queensland, the star will reappear on the western side of the moon, but it will be more difficult to notice its reappearance on account of the brighter edge of the moon on that side. In the north the occultation of the star will be of shorter duration.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

A valuable paper on the influence of the composition of foods on the health of live stock by Mr. Brünnich is an important feature of this issue. Mr. McGrath's notes on separation and the separator will be appreciated by dairymen. Passion fruit and strawberry culture are discussed by Mr. Benson, and Mr. Girault has added some notes on insects infesting fruit in Western Queensland. Ear Rot is the subject of a memoir by Mr. Tryon, and which has already been published in pamphlet form. The Bunchy Top Investigation Committee supplies a description of the disease with some finely reproduced illustrations. Results of South Burnett wheat trials are noted by Mr. Gibson. An interesting plant, a species of Gomphrena, is described by Mr. White, who also has a note on the weeds of Queensland. Mr. Rumball has a useful paper on worms in poultry. Mr. Shelton's contribution this month covers the several methods of administering medicine to pigs. Regular features are well supplied, and the March Journal is up to the high standard set in preceding numbers.

"Bunchy Top" in Bananas—Alarmist Statements Deprecated.

The Deputy Premier and Minister for Agriculture (Hon. W. Forgan Smith) discussing various matters affecting the banana industry with representatives of the Metropolitan Press recently, called particular attention to the fact that the "bunchy top" disease had been occupying the serious attention of the departmental officers for some time past. Full and complete investigations had been made and

experiments conducted with a view to (1) determining the cause of the disease; and (2) devising measures to combat it with a view to its complete eradication. No undue publicity, however, had been given to the matter, and the Minister deplored the panicky references to it in some quarters which must affect the banana industry prejudically.

In 1920, the disease in New South Wales was investigated by officers of the Queensland Department, and its course in that State was subsequently closely watched. In 1922, departmental officers, conjointly with their confreres in New South Wales, furnished a report on the matter and recommended the carrying out of joint investigations covering the causation, prevention, and cure of the disease.

Following on this, the Queensland Government secured the appointment of a joint committee consisting of Professor H. D. Watt, the Professor of Agriculture of the Sydney University, representing New South Wales, Professor T. G. B. Osborne, of the University of Adelaide, representing the Commonwealth Government, and Professor E. J. Goddard, of the Queensland University, representing Queensland. This committee submitted certain recommendations in February, 1924, and, as a consequence, a campaign against the disease was planned. A Bunchy Top Investigation Committee was appointed and an Experiment Station established at Tweed Heads to discover if possible the cause and remedy for the disease. Professor Goddard was appointed supervisor of the investigations. In July, 1924, Mr. H. Collard, of the Fruit Staff of the Queensland Department, was sent to Fiji to observe conditions in those islands, so that anything that might be gleaned there might be applied to the benefit of the industry in Australia. The final report of the operations at the Tweed River Station and the recommendations arising therefrom had only just been submitted, but in the meantime every action possible had been taken to prevent the spread of the disease in Queensland, and any districts where "bunchy top" had been discovered had been quarantined immediately and traffic in suckers from those areas prohibited absolutely.

For some time past seven plant inspectors of the department had been exclusively engaged on "bunchy top" investigation work, while two officers in the far North had been specially brought to Brisbane to gain field knowledge of the disease.

In the course of the past two years the Queensland Department had expended over £2,000 on "bunchy top" investigation alone. Other diseases of the banana are receiving similar attention, and an entomologist had been devoting his whole time for over five years to the banana beetle borer. Another disease of the banana, thrips, is also engaging the special attention of another entomologist.

In addition, Professor Goddard's services as a consultant in these matters have been retained specially by the Department. The Cabinet has since approved of the continuation of the "bunchy top" investigation, the cost being provided in equal contributions from the Commonwealth, New South Wales, and Queensland Governments. Although the investigation has advanced to such a stage that it is possible to submit recommendations for the control of "bunchy top," there are two aspects of the work in connection with which it is considered further inquiry is warranted. These relate to certain entomological and pathological problems which it is hoped to soon elucidate. The further investigation will involve a contribution of £250 a year from each contracting Government who has agreed to the payment of its quota.

The Queensland Government, added Mr. Smith, has also approved of the conduct of an investigation into the cause and control of the obscure disease in bananas known as "squirter." The co-operation of the Commonwealth Institute of Science and Industry has been secured, and that Institute is giving a guarantee of £500 towards the cost of the investigation, conditional that Queensland provides a similar amount. To this the Cabinet has agreed.

Checking "Bunchy Top"—Departmental Activity

In the course of a recent Press announcement the Deputy Premier and Minister for Agriculture and Stock (Mr. W. Forgan Smith) stated that the intimation that "bunchy top" had been discovered in a Northern district had been confirmed by the local inspector. On one plantation two infested stools were found and on another one infested stool was discovered. All were destroyed immediately. In both cases the suckers had been obtained from a Southern district towards the end of last year. The fact that these suckers had been sent to the Northern area had been known since the discovery of the outbreak near Brisbane, and, anticipating that "bunchy top" would make its appearance in the North, the Director of Fruit Culture (Mr. A. H. Benson) took every precaution to meet the situation by bringing the two Northern inspectors to Brisbane and instructing them in the symptoms of "bunchy top" and the methods of procedure as recommended by the Bunchy Top Investigation Committee. These officers visited the Tweed for practical field experience, and were afterwards enabled to study closely the disease in all its stages in the districts in which it has occurred. In addition to this, the Department, with the aid of the Railway Commissioner and certain growers and agents, endeavoured energetically to trace to their destination the suckers distributed from infected areas. Unfortunately, continued Mr. Smith, efforts in this direction had not been supported by all growers and agents, but, nevertheless, the Department was now able to appreciate the exact position in respect to the possibility of "bunchy top" appearing in Northern banana areas, and in order that every person to whom suckers had been sent in these localities might identify the disease a copy of the recommendations of the Bunchy Top Investigation Committee embodied in its pamphlet, and which is reproduced in this issue of the Journal, was despatched to each. Other practical measures of confining the outbreak to areas in which the disease has made its appearance and towards ultimate eradication are being energetically applied.

Imported Maize—A Shipping Anomaly.

The Minister for Agriculture (Hon. W. Forgan Smith) stated recently in the course of a Press announcement that for some years past the Government had been in direct communication with the Federal Authorities urging the necessity for the imposition of an import duty of 3s. per cental on maize imported into Australia from South Africa, because of the serious position accruing from the dumping of such maize on Australian markets. Under the 1921 tariff, the duty on maize was fixed at 1s. 6d., 2s. 6d., and 3s., but South African maize was admitted at 1s. under "*The South African Preference Act of* 1906." The Commonwealth Government advised that an increased duty could only be imposed by Act of Parliament and as duty on South African maize involved the question of reciprocal tariff arrangements between the Commonwealth and South Africa, there was a difficulty in giving effect to the requests of the Queensland Government.

At a later date the Queensland Council of Agriculture agitated for an increased duty on maize from South Africa, and its action was supported by the Queensland Government. As a result of combined efforts, an anti-dumping duty of 7d. per cental was imposed on maize. With the suspension of the anti-dumping duty, an endeavour to have an import duty of 3s. per cental imposed on all maize introduced to the Commonwealth had and was still, being vigorously prosecuted. A case was presented before the Tariff Board, which reported to the Federal Government on the subject. Mr. Smith was of the opinion, apart from the question of duty altogether, that there should be a complete embargo against the importation of maize grown by coloured labour either in South Africa or elsewhere. Queensland growers of maize should not be expected to compete with the cheap labour conditions obtaining in South Africa.

In the course of last season the anomaly was presented in the case of the ship that carried Queensland maize to England and on its return brought a cargo of South African maize to Townsville. That was a state of affairs, continued Mr. Smith, which should not be allowed to continue. Queensland has large areas of land suitable for the cultivation of maize and everything possible should be done to protect and foster our own Australian resources.

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received from the Acting Entomologist at Meringa, near Cairns (Mr. A. N. Burns) the following report (23rd *January*, 1926) :—

NOTES ON CANE BEETLES.

Grey-back Cane Beetle (*Lepidoderma albohirtum* Waterh.).

As anticipated the welcome rains which fell over the period 28th December and 3rd January brought forth another—and most likely the final—emergence of these beetles. Following the first two days of this rain, when 1 inch was recorded, a marked increase in the evening flight was noted, and large numbers were to be found on the feeding trees.

A good many of these beetles still remain (12th January), but a rapid daily decrease now occurs. Further rains in the near future may bring out a few more of these insects. Occasional stragglers will probably continue to emerge even on into February.

First, and even second stage grubs (two of the latter were found under one stool at Meringa, 9th January), are now to be found feeding at cane roots. These are undoubtedly the offspring of beetles that emerged during the emergence that occurred after the rains in November. With over a month's time between each emergence of the beetles, the resulting grubs will continue to hatch from the eggs well on into February, so that grub attack this season will most probably be extended until late in the autumn. Fumigation should therefore be carried out at such a time as to catch grubs from the present emergence as well as those from the November one.

Frenchi Cane Beetle (*Lepidiota frenchi* Blackb.).

The first emergence of this cane pest took place following the recent rains, and for about a week every evening moderately large numbers of these beetles were noted flying about half an hour or so before the grey-backs in their mating flight. After flying about for a few minutes in great agitation they settle on convenient low objects, bushes, fences, &c., and mate, the females resting first and being quickly surrounded with males. When a female has found a mate the other males fly round again seeking other females. During the act of mating the male hangs head downwards from the female and reversed with his mate, sustained only by the genitalia.

Another, and very likely the general emergence of this insect will in all probability take place after the next soaking rains.

Rothei Cane Beetle (*Lepidiota rothei* Blackb.).

In company with the emergence of ''frenchi'' beetles, a small number of these insects was observed, and late each evening specimens flew into light. Mating pairs were found on a few bushes, usually in situations at a greater elevation than *L. frenchi*. According to Dodd, in Bulletin No. 16 of this office, 1921, page 56, this species appears to be somewhat local in its occurrence, appearing to be found mostly in the area around and near Gordonvale and district.

As with *L. frenchi*, the main emergence of this beetle has yet to take place. Its mating habits much resemble those of the preceding species, but the act of mating only occupies at longest a period of about two minutes, quite unlike any other species of its genus.

Anomala Beetle (*Anomala australasiae* Blackb.).

The recent rains have also been responsible for a fairly large emergence of this, so far, comparatively minor pest of cane. Numbers have been noticed every evening flying in company with *L. frenchi* and *L. rothei*, and mating chiefly on lantana bushes and fence posts. It is a well-known fact that this beetle favours lantana bushes, resorting chiefly to the terminal branches bearing the flower clusters. It is on the latter that the beetles feed, eating the corolla out of the flowers. Already the numbers of these insects are diminishing rapidly, so that it seems that this last emergence is the final one.

Christmas Beetle (*Anoplognathus boisduvali* Boisd.).

Very few specimens of this ordinarily plentiful cane pest have so far been observed, even immediately following the rains. Occasional beetles have flown to light at Meringa, and whilst collecting grey-backs from feeding trees a search has frequently been made to determine the prevalence of the former species in its feeding trees—namely, poplar gum (*Eucalyptus platyphylla*), bluegum (*Eucalyptus tereticornis*), and box (*Eucalyptus leptophleba*), with the result in each case of only an odd specimen being found. The main emergence, therefore, of this species may still be pending after further rains, for in 1920 (also a very late season) the main emergence occurred from the 10th to the 15th of January.

Isodon Beetle (*Isodon puncticollis* MacLeay).

Moderately large numbers of this insect have been in evidence during the last three weeks, a good many flying in to light every evening. This beetle does not occur in "flights" or "swarms" like the grey-back or frenchi beetles, the only evidence of its emergence being shown by those flying in to light.

The damage done to sugar-cane by the grubs of this species is apparently almost negligible. Although they are to be found in isolated patches, their occurrence there is mainly due to there being manure or humus in the soil. Grubs have been previously recorded from heavily manured soil.

Species of Histeridæ (*Platysoma* sp.) associated with Tachinid Fly Pupæ (*Ceromasia sphenophori* Vill.).

On 10th November, 1925, whilst cutting out Tachinid fly pupæ (*Ceromasia sphenophori* Vill.) from beetle borer infested first ratoon cane on Mr. James's property, on the banks of the Russell River, near Mirriwinni, a borer cocoon was found with several empty fly pupæ inside it, and from all of which Tachinid flies had apparently emerged, with the exception of one. This pupa seemed quite normal from a rough inspection with the naked eye, and close investigation was immediately proceeded with to ascertain the cause why this one remained in this state, whilst the others appeared to have yielded flies.

The pupa was therefore opened, and within the shell was found a Histerid beetle (*Platysoma* sp., No. C. 381, now in the office collection). This beetle must have recently transformed from the pupal stage, for its elytra and other body parts were still of a reddish-brown colour, having not yet properly hardened and deepened in colour. Other beetles of the same species found later were of a jet black colour, and judging from the fact that this pupa was found intact it was concluded that the beetle transformed within the pupa and probably lived at the expense of the stored up fatty products of the fly pupa, if not in its primary larval existence then in the latter period of this stage. However, it is possible that one Tachinid fly pupa contained enough nourishment for the complete development of the Histerid.

No similar case was found to bear out this discovery, but later, on the same farm, several more of this same species associated with the beetle borer and fly pupæ were found, and as if to add further weight to this theory regarding its predaceous nature, it was noticed that wherever this Histerid was intimately associated with Tachinid fly pupæ in borer tunnels in sticks of cane, no living fly pupæ were found. This supposed predatory habit therefore still needs confirmation.

Fumigating Grey-back Cane Beetle Grubs.

Examination of cane stools in areas usually grub-infested has shown that the time for applying grub fumigants to the soil is now approaching, as indicated by the appearance of young grubs. The recent rains have created vigorous growth in the canefields, and in general the cane looks healthy and green, there being at present certainly no indications to denote the advancing attack from grubs, with the exception of the isolated patches where the cane has already wilted through the ravages of the "frenchi" grub.

This healthy looking cane will not, however, begin to show the effects of grey-back grub attack until about early March, when by that time the grubs will be in the third stage, and the root systems of the cane stools almost eaten out.

Arrangements are therefore being made for the carrying out of extensive field experiments embodying the uses of various solid and liquid fumigants to be used against these formidable pests. These experiments are to be carried out as soon as the grubs are all feeding, and the weather still favourable for getting best results from fumigation.

The Director of the Bureau of Sugar Experiment Stations has received the following report (20th February, 1926) from the Acting Entomologist at Meringa, Mr. A. N. Burns:—

Attacks by Army-worms.

Reports have come to this station from different farmers in the district, the chief centres being Highleigh and Edmonton, of extensive damage to cane through the attacks of caterpillars. Inspection of each attacked area showed in each instance that the injury was caused by the same species of larva—one of the "army-worms," but not either of the two species that are usually responsible for "army-worm" damage to cane in Northern districts.

The insect in question is probably *Prodenia exempta* (Walker)—we have not yet had specimens of the adults determined—one of the Noctuidæ, a family of moths which contains many species that are responsible for an enormous amount of damage to economic crops.

In each of these attacks the damage extended over areas of from 3 and 4 up to 20 acres. In one instance the larvæ had eaten to ground level a field of about 20 acres of young corn in three days, and were then moving *en masse* into canefields which bounded the eaten corn on three sides. At noon the day after the larvæ had left the corn the first seven rows of one of these areas of cane were very badly damaged; the larvæ were at this stage slightly over half-grown, so that the greatest amount of damage had still to come. They were steadily advancing, and it is quite probable that before evening another six or eight rows of cane would have been attacked. On another side of the eaten-out cornfield a narrow road had to be crossed by the larvæ before they could reach the cane; every blade of grass (crowsfoot) on this track had been eaten, and the larvæ were pouring into the cane in numbers so great that it was impossible to walk without destroying probably as many as fifty at each step.

Several species of Tachinid fly parasites were observed in fairly large numbers flying about amongst the larvæ and ovipositing on some. In one instance a fly was watched; it deposited ten eggs in a space of less than half a minute on ten different hosts. The fly would hover over a larva, touch the body with its ovipositor, and then fly off to another host. The larva in each case fell to the ground immediately after the fly had laid its egg.

The natural control measures exerted by these flies would not affect the present generation, for larvæ when parasitised by Dipterous parasites (Tachinid flies) almost invariably attain their full size and feed up till pupation, the parasite larva leaving its host shortly after the latter has pupated.

Control Measures.—If the larvæ are centred over a given area an efficient control measure may be resorted to by digging a trench or running a deep plough furrow between the infested and clean fields, taking care to have the vertical face of the furrow opposite the advance of the larvæ. Poison bait made up of Paris Green, bran, and molasses in the following proportions will be found effective:—

Paris Green, 1 lb.; bran, 2 lb.; molasses, 2 quarts. Add enough water to reduce this mixture to a thick mass which will break up easily, and sprinkle it thinly in the bottom of the trench.

Should the larvæ have already gained access to clean cane, a good control method to employ is to spray two or three rows of the cane just in front of the advancing larvæ with an arsenate of lead solution spray. Two pounds of arsenate to 50 gallons of water is sufficiently strong, and the ready-made arsenate of lead compound is the easiest and best to use. The affected rows may also be sprayed after this with good result.

Description.

Larva.—Length, when fully extended, 1¼ inch. Colour, pale-green, dorsal line dark-green to green, broad, longitudinally halved by three whitish undulating thin lines. Sub-dorsal stripe yellowish-green, fairly broad, divided almost centrally by a metamerically broken green line; below this sub-dorsal stripe and parallel to it runs another broad green stripe distinctly streaked with white. Lateral stripe very dark-green, almost black, moderately broad. In this stripe at the centre of each segment after the third from the head is a round white spot. On the lower margin of the stripe in front of each of the spots are situated the spiracles, which are jet black. Below this stripe again occur two white narrow stripes separated by a greenish-yellow line regularly marked with brown. Ventral area, including claspers, pale-green, prolegs yellow. In the region below the lateral stripe is an irregular shaped patch of whitish spots on each segment. Head brown, with a white V-shaped marking, with its apex directed backwards. On the first segment behind the head, dorsally, is a jet black collar extending to the sub-dorsal area on each side of the body.

Pupa.—Length, approximately five-eighths of an inch. Colour, reddish-brown, at junction of abdominal segments darker brown. Wing covers lighter brown. Before emergence the eyes darken. Pupation takes place in the soil, generally from 1 to 2 inches below the surface.

Moth.—Width across the expanded wings, from 1 to 1¼ inch. Antennæ filiform, two-thirds length of costa. Forewing very variable, usually some shade of dark-brown, a black spot at end of cell, a zig-zag black line running from costa to hind margin beyond end of cell. This is bordered on the outer side by a similar whitish marking which does not extend as far as the hind margin, but terminates in an irregular ovate black marking about half way to the hind margin. A radulate black marking runs along termen from apex to angle, cilia grey. Hindwing light-fawn coloured, suffused dark-brown to black towards costa and termen, veins dark-brown, cilia pale silvery grey.

The larval stage occupies from twelve to fourteen days, pupal period nine to eleven days.

Notes on Cane Grubs.

Recent examination of cane stools in areas which usually are grub-infested has revealed the presence of grubs of the grey-back cane beetle (*Lepidoderma albohirtum* Waterh.) in all three stages, the greatest number at present being in the second stage. Grubs of the "frenchi" cane beetle (*Lepidiota frenchi* Blackb.) are still feeding in the third stage, and will continue to do so till about April, when they will cease feeding and tunnel deeper into the soil to pupate. Young grubs (first stage) of the Christmas beetle (*Anoplognathus boisduvali* Boisd.), the Anomala beetle (*Anomala australasiæ* Blackb.), and *Dasygnathus australis* Boisd. are also to be found in isolated patches feeding at cane roots.

Paradichlorobenzene.

Two plots, each one-tenth of an acre, of grub-infested cane have been treated with this fumigant, using doses of ¼ ounce placed about 15 inches apart on each side of the rows of cane. Injection was carried out by means of a Massey-Harris corn planter fitted with improvements and alterations for the injection of paradichlor. Control plots of equal size were established beside the treated area. Another similar experiment has still to be carried out with this fumigant in another part of the district.

Calcium Cyanide (Flake Form).

In conjunction with Mr. Wolstenholme, a plot of grub-infested cane embodying six rows each 50 feet long was treated with ⅛-oz. doses, four to a stool, of the flake form of this fumigant. A control plot of equal size was left adjacent. Results will be given later after the final digging which is to take place three weeks after the time of injection. Another experiment of one-eighth of an acre in extent, also using flake form of the fumigant, is being put down this month.

See-Kay.

Two blocks of grub-infested cane, each 130 by 45 feet, have been treated with 1 drachm and 2 drachm doses respectively of this fumigant. Control plots of equal size have been marked out adjoining the treated areas.

Chlorocide "A."

Two plots of grub-infested cane, each one-tenth acre in extent, are being treated with Chlorocide "A." The fumigant is being sprinkled in a drill opened up a few inches away from the stools on each side of the rows of cane and the material sprinkled in at the rate of 4.26 drachms per yard (1 cwt. per acre) in one plot and 6.39 drachms per yard (1½ cwt. per acre) in the other plot. Control plots of equal size are established alongside the treated cane.

Dehydrated Tar Repellant.

Five rows each 125 feet long have been planted with Badila cane sets having their ends dipped in dehydrated tar before planting. Another row of equal length was planted having the sets wholly immersed in the tar before planting. In each case the sets were well drained before planting, and were planted in land infested with grubs of the grey-back cane beetle (*Lepidoderma albohirtum* Waterh.) and "frenchi" cane beetle (*Lepidiota frenchi* Blackb.). A control block planted with undipped sets was put in beside the treated plots.

FIELD REPORTS.

The Director of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (22nd January, 1926) from Mr. R. S. Mungomery, Southern Assistant Entomologist:—

Since my transfer to the southern sugar districts from the Meringa laboratory, I have spent the time in commencing an inspection of the Isis district for cane pests, and during this period work has been confined mainly to the Childers and Doolbi cane areas.

These areas at present are looking particularly well, due to the timely fall of 3 inches of rain about the middle of the month, followed by a similar amount towards the end of the month. Though there had been a minor emergence of beetles in November, this fall of rain on the 13th December heralded the general emergence of the common cane beetle (*Pseudoholophylla furfuracea* Burm.), and some of the older residents consider this to have been one of the largest flights of beetles in the Isis district for many years. It is gratifying to know that growers are fully awake to the seriousness of the depredations of this formidable pest, and through the Pest Fund of the Isis Shire Council payment at the rate of 1s. and 1s. 6d. per quart for grubs and beetles respectively is being made. In this manner upwards of £500 has this year been disbursed, of which almost £100 went towards the collection of beetles, which accounted for approximately 830,000 specimens, and the remainder in the collection of cane grubs, several millions of which must have been destroyed.

Though this must necessarily exercise a great control on their natural increase, still grubs are very plentiful in the localities visited, and have occasioned a great amount of damage both to young plant cane and to ratoon crops. So severe has been the injury in certain cases that young plant cane has had to be ploughed out and replanted three times before a successful ''strike'' has been obtained. Most farmers follow the wise practice of picking up the grubs in the furrow when ploughing, and if this be done at any time excepting during the winter months, when the grubs burrow deep down into the soil, their land can be made reasonably free from grubs and ensure a good plant crop.

With ratoon crops a different aspect is presented, and there are instances of ''grubby patches'' developing and remaining almost exactly in the same place year after year, and in this case fumigation must be resorted to. It will then be possible to ratoon a third and fourth time, whereas at present many growers seldom carry their crops further than to second ratoons, and cases are many in which first ratoons have been absolute failures through grub attack.

Fumigation of the soil with paradichlor against ''white grubs'' has not been tried very extensively in the Isis district, and growers for the most part are unfamiliar with this chemical, also the method of injection, so I propose to lay out as soon as possible a few test plots to demonstrate its effect.

A small species of termite (white ant) has been found on various farms affecting ratoons, and also eating into the ''sets'' which had recently been planted; in one instance as many as twelve consecutive ''sets'' had been destroyed. In all these cases there was evidence of infestation from wood, such as old stumps or fence posts in the immediate vicinity, and farmers were advised to burn all surplus wood and to poison infested fence posts with the arsenic-caustic soda-molasses solution.

The Director of the Bureau of Sugar Experiment Stations has received (25th January, 1926) from Mr. A. P. Gibson, the Northern Field Assistant, a report as under:—

Innisfail.

The rainfall for the greater part of December was scanty; only 18 points had fallen up to the 30th. The last two weeks of the month many hopeful storms appeared, some looked threatening, but they passed away rainless until the aforesaid date, when 131 points fell in good time and temporarily relieved the situation. The grand total rainfall for the year (1925) was 143.80 inches, and was quite up to the average; 75 inches of this were precipitated during the months of February and March.

The thermometer climbed up over the 100 degrees mark three days in succession, 102 degrees being the maximum on Christmas day, and at the same time having a wet bulb reading of 80 degrees.

The prevailing dry and hot condition greatly benefited harvesting and cultural operations, but were not conducive for continuous crop growth. It dried up the surface water and compelled many residents to buy water, costing 10s. 6d. per 100 gallons.

Harvesting and Grinding Operations.

The grinding season is speedily drawing to a close. Goondi completed its crop of 168,000 tons on the 14th December; South Johnstone expected to finalise its crop of 200,000 tons on the 15th January; Mourilyan Mill is still going its hardest. It has no chance of fully treating its record tonnage; 126,000 tons had passed through the rollers up to the 9th instant. The average mill quality of cane to date was 13.35, but is now declining. The management still hoped to extend grinding operations to middle of February (weather permitting), when perhaps 150,000 tons would be treated, leaving 20,000 tons approximately to stand over. This is less than first of all expected, due to the fact that some thousands of tons of burnt cane had to be condemned.

The mills have been fortunate in having favourable weather. This has permitted a good cane supply and delayed the new crop growth, thereby preventing a rapid decline in the sugar content. Ideal conditions enabled the many harvesters to work continuously, thereby making big cheques. On the whole the harvesting work appeared satisfactory; in a few instances too high ground cutting was noted. This is detrimental to subsequent ratoons. The carrying on of grinding operations into the month of January and February is not desired for many reasons. The principal are as follow:—(1) Great decline in the commercial cane sugar; (2) harvesting and subsequent husbandry are often delayed by prolonged wetness; and (3) the late cut canes are not sufficiently advanced for the following grinding season.

Manuring.

This month great quantities of fertilisers have been applied, and since the rains of recent date had worked wonders. When surface dressings of manure are applied it is imperative that the cane rows are at least clean.

Green Manuring.

The indispensable organic matter in the soil is derived almost entirely from decayed vegetable matter. Farmers do not grow leguminous crops to the extent that they should. The importance of this is being realised too slowly; the practice is carried on to a greater degree here than elsewhere. It is not recommended to interplant corn and cowpea on the grounds that the former mentioned harbours Mosaic; this disease was noticed where corn and cowpea were growing conjointly.

Patches of cowpea were found wilting and dying; a minute creamy to brown borer was located in affected stems and branches.

Pests and Diseases.

The notorious rat and weevil borer (*Rhabdocnemis obscurus*) still are causing havoc in the yet unharvested cane paddocks. They are responsible for increased harvesting rates, reduction of cane tonnages and c.c.s., and the injured portions of the stem serve as inlets for destructive pests and diseases. Thousands of pounds are lost annually to the grower. Farmers and millers should co-operate and tackle this dreaded field rat in a systematic manner, otherwise extended losses may ensue. The Pest Board and some of the mills during the past have done good work in this particular branch. The curling of the leaf is just one of Nature's little ways of conserving moisture when the soil supply is becoming low, by so doing the leaf surface exposed to the fierce rays of the sun and drying winds is minimised and evaporation reduced. At this stage it is difficult to detect the primary stages of the various diseases. Many English and native bees were observed resting on the young cane leaves affected by the aphis sacchari, the punctured leaves evidently yielding some sweet substance desired by them.

Dead Cane.

Standing condemned, burnt cane should be cut at the earliest convenience and placed in the convenient interspaces, or, better still, removed off the paddock. This operation is costly, but if left interferes with subsequent harvesting, and may cause serious damage to the stubble or prove a breeding-ground for pests.

Cane Culture.

Cane culture is perhaps the worthiest and most profitable pursuit in the North. It is certainly one of the most useful. To-day a cloud of depression has fallen heavily upon it, resulting in a low price, and it is clear that only by judicious management and reducing the cost of production can we all hope to make it pay.

Crop Prospects.

The 1926 crop growth at the end of the year was backward and perishing, due to the absence of moisture, but timely rain storms came along and have caused a transformation. The leaves were washed clean, and they immediately uncurled, and the fast-growing crop is speedily painting over the bare patches of cultivation. The present prospects are favourable for another good crop, but there appears to be little chance of it overshadowing in tonnage the past record season. There are people of many nations interested in cane-growing here. One requires to be a linguist to make oneself understood. As a rule, the foreigners are industrious and keen agriculturists. Those who do understand seem deeply interested in things pertaining to cane culture. The average cane price for the district is to be about 32s.

Tully.

The Tully, Queensland's newest sugar-producing district, was again briefly visited. Some people are already gazing into the district's future and seeing greatness.

Stormy rains had fallen since my last visit. This, in conjunction with the prevailing sweltering heat, had decidedly improved next year's prospects, but even so the cane was backward.

Crushing.

The mill had worked better the last few weeks, and was expected to complete its maiden crop of 30,000 tons on the 12th January. Practically all the cane crushed was burnt. Much Badila had been burnt and harvested too long before being treated, therefore being highly fermented. Great activity prevailed. Huge silky oaks, monarchs of the scrubs, were being tumbled for their valuable timber, and the dense tropical jungle, the home of beautiful birds, is fast giving way to the ever-extending sugar areas. Cane-growing is a new venture for many here; some, in consequence, were paying dearly for their experience.

Scrub Felling and Burning.

A good fire improves the soil condition and considerably reduces subsequent logging costs. Various things influence this important operation, such as time of cutting and judicious falling, the complete severing of all trees from their respective stumps, otherwise they are slow in drying. Firing with the assistance of a gentle breeze during the heat of the day is preferable to night burning.

My visit was confined to the new perpetual leaseholders situated some three miles north from the mill and connected thereto by a tramline. There are some sixty-six farms, ranging from 55 to 75 acres. Of this number fifty-six are occupied, and it is computed that 200 acres had been planted with cane.

The all-scrub soil is composed of the usual fine to coarse grey to reddish-brown decomposed granite, and lying adjacent to the ranges. It is level for the greater part, and drained by the Bookle Bookle and Bulgan Creeks.

Planting.

Planting the virgin scrubland was in progress. It is a common and good practice to make the cane holes by spade, for which 4s. per 100 holes is paid. Farmers had hazy ideas regarding spacing of plants and width of drills. This, as a rule, is dependent on the fertility of soil, the variety to plant, and the interspace most convenient for cultural operations. Five feet drills and about 2 feet spacing for Badila should suit the Tully lands. Some growers have planted too shallow. The cane at present looks well. There is the probability of the resulting crop tumbling badly when the soil becomes very wet, owing to insufficient and surface root anchorage.

Pests and Diseases.

Damaging cane sets underground: (1) Termites (white ants), of which there appeared to be a small and a medium sized ant. The damage would probably be reduced when the wet season sets in. (2) Minute, active, black beetles, found mostly boring through the nodes of plants. This seemed to be the soft wood borer. Brown Rot was located on three farms, in N.G. 15 (Badila) virgin scrub land. The growth of the stools affected was quite equal to the surrounding one, and the root system was considered normal, but dead and pulpy. When the stool is attacked it quickly dies.

Red Rot was located in canes being used for plants. Several fields previously planted from this area carried on the disease.

Some growers in ploughed areas are unwisely depositing the fully-grown canes into drills and cutting same into plants as they lie. This is not plant selection, and the tendency is to extend pests and diseases.

The ratoons appear to be doing better than plant cane here. The probable reason is that the soil, since freed of its dense jungle, is gradually being sweetened by the process of aeration and direct sunlight.

It is computed that about 5,000 acres will be cut for the Tully Mill next season. This should yield approximately 100,000 tons.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (29th January, 1926) from the Central Field Assistant, Mr. E. H. Osborn:—

Burdekin District.

Unfortunately, the excessively dry conditions that had been experienced upon the Burdekin so long were still prevailing, and right throughout the district the effects of such a prolonged dry spell were very apparent. In the middle of December great hopes were entertained of a good fall; but, unfortunately, only some 90 points were the result of much wind and thunder. Intense heat accompanied this dry spell, and, although the irrigation plants were pumping to their full capacity, the crops in general were below the usual standard of the Burdekin cane at this period of the year. With so many set-backs it is no wonder that opinions were locally expressed that, in view of the present sugar market, profitable cane-growing in an extra dry season in this area will be very hard, the salvation of which may probably be smaller areas requiring no outside labour, very careful cultivation, and growing only the most suitable cane for each particular farm.

As regards harvesting costs, although high considering the present average grower's return, yet the contract system ensures that the amount paid is commensurate with the work carried out, and as a class the local cutters are a reliable and hard-working body of men, in many cases having harvested the same farms for many years.

Cane Varieties.

When writing of above in last month's report, mention was made of very satisfactory returns having been obtained from E.K. 28, both as regards tonnage and density. As these results were obtained upon medium forest soil, it appears that such soils are more suitable for this cane than the heavier and deeper soils adjoining the creek and river banks. In fact, the experience of several growers of the cane in question upon such soils is that, although the crops are heavy, the density returns are only medium.

Diseases.

Owing to the climatic conditions being very unfavourable for disease detection, very little of such was noticed. Leaf Stripe or ''Downy Mildew'' that had been noticed in a large block of plant B. 208, now showed marked effects of same in the ratoons, but possibly the very dry conditions have a good deal to do with such. In relation to this disease, Mr. B. Parker, of Airedale, upon whose farm the disease was noticed some eighteen months or so ago in B. 208 and N.G. 24 (Goru) ratoons, mentioned that after harvesting he ploughed the crop out, not replanting until the following spring with the same variety (B. 208), but obtaining seed from another farm where the disease had not been seen. So far the cane looks clean, although it may be premature to say that the disease has been eradicated, as it may yet appear in the ratoons.

Mosaic was noticed upon several farms in the Airedale locality. In one in particular where it has been seen in plant H.Q. 426 (Clark's Seedling), it was not so apparent (just then) in the first ratoons now to be ploughed out, but, as already mentioned, weather conditions made disease detection very hard. Upon another farm the disease was seen in plant B. 208 adjoining some diseased H.Q. 426. Mentioning such, it is not surprising that secondary infection should be observed in this locality, for numbers of little corn aphides were noticed upon the corn and sorghum growing in close proximity to the cane on several farms.

It has been frequently pointed out that to grow such crops where Mosaic is likely to occur is creating a potential danger, and the grower cannot be too careful, especially in these hard times.

Top Rot.—Easily the cause of most loss to the growers of Badila upon the Burdekin; is now being investigated through a series of inoculation experiments by an officer of this Department. Such experiments may lead to a different view being taken of the direct cause of this very serious disease.

White Ant (Giant).—This pest did not seem to be as bad as formerly at Jarvisfield, and several growers, where the pest was at its worst, credit the following mixture with giving good results:—

Arsenic, 2 lb. by weight.

Caustic soda, ¼ lb. by weight.

Cover mixture with water, causing soda to boil and dissolve arsenic, then add to above molasses 4 gallons, thoroughly mixing up. To obtain best results all adjoining timber, such as stumps, fencing, posts, &c., require poisoning.

Ingham Railway Line.

Along this line recent showers had freshened the pasturage and cane up wonderfully, contrasting forcibly with the Burdekin in its dry state. The area from Rollingstone to Helen's Hill seems to have fared better than that further north, even Tobanna did not have as much as Helen's Hill. Although these showers have been useful, they have only partially relieved the situation, and at this juncture rain is urgently required to ensure a decent crop for 1926.

Harvesting operations were very active. Railway wagons then being as plentiful as they had been scarce in the earlier part of the season, unfortunately in the hottest period of the year, and at a time when the density is generally very low.

Early in the season the estimated tonnage was placed at 20,000 tons, but probably 17,000 tons will be about the harvest. Of this quantity Tobanna, with seventeen suppliers, is the largest supplier, and should supply some 9,000 tons. At this particular siding several large plantings of young cane were noticed, but in general the appearance and growth of same was very backward, the early plant looking far better in proportion than that put under later on. Some of the land is low lying, and should be very wet in a heavy wet season. Draining such places is very necessary.

Good density returns were obtained. Mr. J. C. Heard, mentioning that cutting right throughout the season to date, his figures were only once under 15 c.c.s. Badila was the cane. At Helen's Hill some uncommonly good N.G. 15 (Badila) was coming in, and here again some fair-sized paddocks of young cane, mostly N.G. 15, was remarked upon.

At Yuruga, Mutarnee, Moongabulla, Bambaroo, and Rollingstone the crops were looking green and healthy, considering what a dry time they had gone through. The ratoons except in a few places were, however, rather backward, and have a lot of leeway to make up.

Motor Transport

Is much in evidence upon this line, five power trucks pulling into one siding. Everywhere the users of these trucks are very keen upon them, especially the light style of truck, and aver that there is no comparison between them and horses for such work, both for economy and quickness.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations has received the following report (15*th February*, 1926) *from Mr. R. Mungomery, Assistant Entomologist:*—

Isis District.

Here I was able to complete a survey of the whole district for insect pests, and found that grub attack represented by far the greatest damage, and, judging from the extent of the injury and the degree of infestation, this species (*Pseudholophylla furfuracea* Burm.) is only rivalled by the notorious "grey-back" (*L. albohirtum* Waterh.) in its ravages in the cane areas this year.

Although individual grubs can be found outside these limits, the farms showing the greatest damage lie in a line from Cordalba to Childers, thence branching to

Horton and South Isis, and following very closely to the railway line. As the railway line tapped the centre of the Isis scrub lands, it will be seen from this that grub infestation is confined chiefly to the rich red volcanic soils, while those lands situated nearer to the forest are little troubled. Notwithstanding that grub damage is most noticeable in the red volcanics, odd cases have been met with in which yellow and white friable soils have been seriously infested, but in no instance have I found them to be present in any alarming degree in the low black alluvials or white forest lands. Of course, the losses incurred by this pest vary directly as the infestation, but individual losses can best be estimated when many growers give as a moderately reckoned amount the sum of £100 to £200 as their annual loss, and maintain they suffer a worse gruelling from grubs than from the periodical dry spells to which the district is subject.

It is an easy matter to find as many as thirty specimens under a single stool of cane, but as many as sixty have been found, and one can imagine what little chance cane has of actually surviving, without thought of its producing an average tonnage, against such adverse conditions.

Though those to which reference has been made as occasioning all this damage are mostly large third stage grubs, several small first stage grubs are now to be found, and these will be responsible for the injury in the coming spring, so where farmers know these grubs to occur they should fumigate with either carbon bisulphide or paradichlor. as soon as possible, and so avoid this coming evil.

Experiment Plots.

With a view to familiarising farmers with the use of paradichlor. and the method of injecting with the "Jarvis" injector, and also to find out the effects of this fumigant on first and third stage grubs of *P. furfuracea*, plots were laid out on the farms of four growers in the district in young August plant cane and first ratoons, all of which were badly grub smitten.

Doses of ⅛ oz. of paradichlor. were injected on each side of the stool, and 1 foot apart in the case of large stools, and the growers in each case are kindly co-operating with me in observing any changes or results during my absence.

Parasites.

Too much cannot be expected from natural parasites, and these are remarkably few in numerical strength at present. The parasitism from scoliidæ (digger wasps) is very small, and, although I had ample opportunity for observation during this month when so much land is under the plough, only a few parasitised grubs were found. The hyperparasites, Hyperalonia sp. of the family Bombylidæ (bee-flies), are very numerous all over the Isis district, and must have an appreciable effect in curtailing the activities of the digger wasps. While dissecting a beetle which I had dug up, to determine its egg-laying capacity, I found inside it five maggots which had almost completely eaten out the abdominal contents, and these maggots I successfully introduced into another beetle of the same species, where they completed their development, pupated, and about a week later emerged as perfect flies (Tachinidæ sp. unidentified). It is difficult to arrive at the extent of this parasitism, for the beetles are usually hidden far underground, and so escape notice, but they must doubtless effect a fair check in destroying the ovaries of the female beetles with consequently no production of eggs.

Several predaceous Asilid (robber-fly) larvæ have been found closely associated with cane grubs, and as many as seven out of nine from under one stool of cane have fallen victims to these voracious feeders.

Moth Borer (*Phragmatiphila truncata*).

Injury from this insect is not very pronounced now, but occasionally standover cane and young cane growing near paddocks full of "natal" and "guinea" grass suffer considerable damage, often making a block of cane very wasteful when it is left with the intention of cutting a supply of plants from it.

Mealy Bugs (*Pseudococcus* sp.).

These are common around the leaf sheaths of older cane, and are well distributed throughout the district. Their effects are not noticeable, since they are kept in check by various natural enemies, the chief of which at this time was an entomogenous fungus which had developed during the wet weather and which I found had killed several.

Bundaberg District.

Only a week was spent in the Bundaberg district, and during this period work was confined to a few of the sub-districts.

P. furfuracea was found on several of the red soil farms in the Woongarra and Qunaba areas, but it remains of minor importance and does not inflict the same damage that it is responsible for in the Isis district.

Lepidiota grata.—Grubs of this beetle have been found to be doing damage in the South Kalkie district, and have eaten out small patches of cane, and the injury very much resembles that due to *L. frenchi* and *P. furfuracea*, and the method of combating it with fumigants is similar.

Caterpillars.—A species of caterpillar was found on the Fairymead Estate, and was eating the cane leaves and generally stripping the plant, the injury very much resembling that due to ''army worms.'' These caterpillars had been feeding previously on the ''summer'' and nut grass, and when these grasses had been cleaned up in cultivating operations they had directed their activities towards the cane. Having no facilities for breeding these, I was unable to connect them with the moth responsible for their appearance, but as several were feeding openly throughout the day they were subject to attack from numerous birds, and others again were parasitised by Tachinid flies, so it is improbable that the following generation will do any appreciable harm.

FIELD REPORTS.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (16th February, 1926) from Mr. E. H. Osborn, Central Field Assistant:—

Herbert River.

That this area must be a fairly solid one is shown by the rapid strides taking place in building and general improvements, for at present four new and up-to-date concrete or brick hotels are going up in the town (Ingham) area, whilst licenses have been granted for one each at Trebonne and Long Pocket. Great improvements were also noticed in the roads, more especially in that being constructed by the Main Roads Board to Halifax. At the latter place a Traffic Bridge is being built that will connect the North Coast Line at Beamerside with Halifax direct, and which should greatly benefit Halifax.

Again, in Ingham the Colonial Sugar Refining Company are intending to remove their cane tram line that now runs down the centre of its two main streets to a less conspicuous portion of the town's activities. Also, upon the outskirts of Ingham, very many new and substantial residences are going up in places that were cattle paddocks only a very few years ago. All this prosperity is solely due to the sugar industry, and any one conversant with Northern conditions must view with concern a curtailment of cane areas, more so when it is remembered that during the season just closed some 445,000 tons of cane (*i.e.*, Macknade 230,000 tons and Victoria 215,000 tons) were crushed.

State of Crops.—Unfortunately, this district at the time of my visit was suffering from extremely dry conditions, for although splendid rain fell during the early part of 1925, October and November were very dry, December was rather better, but January was one of the very driest Januarys known for many years. The following are the registrations:—

	Halifax.	Ingham.
January, 1925	23.05	14.48
February, 1925	16.75	15.06
March, 1925	28.39	24.13
April, 1925	2.81	2.96
May, 1925	.6	.25
June, 1925	1.30	1.49
July, 1925	.15	.33
August, 1925	1.82	1.96
September, 1925	1.43	1.71
October, 1925	—	.12
November, 1925	.5	.43
December, 1925	2.17	1.99
	78.97	64.91

Whilst up to the third week in January 1.99 inches represented Halifax, and only .96 inches Ingham. Naturally such a dry period has had a very bad effect upon the crops in general, and throughout the district, early and late plant cane and also ratoons are decidedly backward; in fact, so much so that in many cases hardly any cane had formed. It seems that the average early plant did not strike too well, and the moderate area of late plant, although better in proportion, is very backward indeed, being far below the usual standard of cane upon the river at this period of the year. This factor will undoubtedly affect next year's crop too, for it will be very hard to get sufficient early plants for this year's planting. Fortunately, good rains have since been experienced.

Cane Varieties.—N.G. 15 (Badila), Q. 813, H.Q. 409, Goru (mainly N.G. 24 B), Korpi, Nanemo, and Oramboo are the principal canes grown, and some fine crops of each have been harvested this year. Of these H.Q. 409 certainly requires early planting—early in March, if practical, or failing that, well after the cold weather has ceased. One experienced grower mentioned that his best results were due to his making it a practice to relieve the soil covering about a fortnight after planting, which he said seemed to give the young stuff a great ''kick'' along. In his particular farm (medium ground) he generally harvested a 35 to 40 ton crop, followed by, say, a 25-ton of first ratoons, using manure, of course.

Q. 813 is now a popular cane in this area upon old and medium lands on account of its good striking and ratooning qualities, several growers speaking of from a 35 to 40 ton crop for plant twelve months old.

Unfortunately, as young plant being a shallow rooter, it does not stand up too well to such dry conditions as have lately been experienced here, but it responds well to good weather conditions, although very wilted looking, and so far it has shown no signs of gum.

Green Goru (*N.G. 24 B*) has a certain percentage of favour, for in light sandy soil under dry conditions it has done rather better than other canes.

Green Manure.—Dry conditions probably account for the fact that the area under crop this year seems far less than usual.

Fertilisers.—Howe's Mixture, B_3, dried blood and meatworks manures are all popular here, whilst sulphate of ammonia as a top dressing is also favoured.

Implements.—Ploughing in trash is always strongly advised, and to expediate this operation the D. 1 disc plough in use in Fiji for some time is now also to be seen upon the Herbert, and is favourably reported upon, quite a few being in use. An Athens plough attached to a Fordson was also doing very good work in breaking up a fairly solid and hard grass paddock.

Diseases.—Due to so much dry weather it was hard to detect symptoms of gumming, and it looks as if the restrictions placed upon H.Q. 426 (Clark's Seedling) have already started to show improvement. Top Rot was seen in first ratoon Badila and first ratoon Q. 813, growing in an experimental plot alongside each other. I understand that it also showed up in the cane in its plant crop.

Invicta Mill (Giru).

When this area was inspected early in February the cane and pasturage looked particularly green and healthy, in pleasing contrast to the dry conditions of the Herbert. Last year's rainfall figures were:—

January	14.53	July	—
February	21.17	August	2.79
March	5.00	September	2.76
April	—	October	—
May	—	November	.06
June	2.00	December	2.03

or a total of 50.34 inches, whilst 3.95 inches were registered for January. Considering that no rain fell for April, May, July, and October, and only six points in November, the crops look surprisingly well, for although there are a number of irrigation plants in the area they are in most cases upon the small size, and only in use when conditions are extremely dry.

During my visit a number of farms situated at the ''Mountain'' and adjoining a beautiful lagoon known as Healey's Lagoon—distance some 4½ miles from Giru—were seen. This lagoon is said to be some 3½ miles long and from about 70 to 80 yards wide, and varying in depth from 15 to 25 feet, and certainly presents splendid irrigating possibilities, for it has never been known to go dry. Upon its banks are some very good farms, capable of growing good and heavy crops of cane for many years.

Although the cane, as mentioned already, looked very green and healthy, it was upon the backward side, and in too many cases showed too much weed growth.

One farm that was noticed after leaving the Mountain was that of Mr. L. Horton, who is trying out several varieties of cane in rather a larger way than usual. H.Q. 409 and Q. 813 each looked well here, and had responded to the freedom from weeds.

Cane Varieties.—Amongst these, Q. 813 is still giving excellent results in poor or medium soil, one local grower mentioned having cut an acre for 36 tons, with an average c.c.s. of 17.2, whilst several growers spoke of their satisfactory returns, too. H.Q. 409 was noticed to be growing in several small patches, but had struck very erratically, having been planted too late, and bears out the views expressed by the Herbert growers about the most suitable time of planting. A few lines of E.K. 28 were noticed here and there, and I understand that there will be a larger proportion of this variety for next year.

Diseases.—Giru has so far been fairly free from disease, but growers must still be careful and use careful seed selection.

Leaf Stripe or Downey Mildew was seen in two places in plant B. 208, and in some first ratoon Imperial where formerly it was seen in the plant, whilst Mosaic was also seen upon two farms in plant B. 208. As all these were only a few infected stools in each case, they were rooted out by the owner.

H. 458 in a plant crop showed peculiar dry streaks in some of the outer leaves, but the grower intends ploughing out, as the density figures are not too good.

Top Rot was noticed for the first time here upon three different farms, all of which consisted of very fair soil, *i.e.*, upon the northern side of the Haughton River in plant and ratoon Badila, and upon the southern side of the river in plant and first ratoon Badila. Portion of these plants came from the Ingham line, the rest being local seed. In this case where the disease was noted the ground was of a very good type, whilst right alongside some cane grown under exactly similar conditions, but in an inferior class of soil, was then free as far as one could see.

In connection with this disease the Bureau has been carrying out some inoculation experiments upon the Burdekin, which may prove of much value in providing data to work upon in connection with control of its activities.

Progress of District.—Giru is rapidly expanding, and within a few weeks the public will be catered for by the opening of two hotels. As regards the mill it had just finished a remarkably good season, having crushed some 78,333 tons of cane for an average c.c.s. of 14.15, all mill records, both as to mill work and value of same being broken, and the manager and staff are to be congratulated.

When it is remembered that of the above 78,333 tons, some 19,500 tons came from the Ingham Railway Line suppliers, and 7,046 tons from the Lower Burdekin, with 1,607 tons from Woodstock upon the Towers Railway line, it will be seen how difficult it was to keep up a regular cane supply at a time when all available Government rolling-stock was taxed to the utmost, and it is to be regretted that some growers do not take these factors more into consideration before blaming the unfortunate cane inspector for any truck shortage.

The Director of the Bureau of Sugar Experiment Stations has received (17*th February,* 1926) *from the Southern Field Assistant, Mr. J. C. Murray, the following report:*—

Bundaberg District.

Since last reporting on cane conditions in this locality there has been a small fall of rain, but not nearly enough. There has been no regular rainy season.

The mills have closed down and cultivation is now in full swing. All classes of ploughs are going from the single furrow disc to the big steam ploughs. There is a general striving towards increased agricultural efficiency and lowering incidental expenditure. Practically all the growers are unanimous with regard to the value of potash as a fertiliser for the red volcanic soils. No negative results have so far been reported where weather conditions were favourable after using this fertiliser as a predominant ingredient.

Regarding fertilising generally, it could be mentioned that the Bureau officers have now fairly complete data as to the requirements of the various types of soils, compiled chiefly from the most reliable source of all—results of local experiments. Analyses have also been made by the Bureau of about every class of soil in the sugar belt.

Growers in the Bundaberg district are recommended to seriously deal with the Mosaic disease in the district this coming planting.

Regarding varieties in the Bundaberg district, farmers are extending their areas of Q. 813. Those on the river are strongly recommended to plant more of this cane.

A disease destroying a considerable number of stools was brought under the writer's notice, but as the same malady was encountered at Beenleigh a more detailed description will follow.

Beenleigh District.

The farmers in this fertile district did fairly well with their cane last year and should have good crops for the coming season, judging by the appearance of the cane at present. One noticeable feature was the number of farmers who are planting the variety Q. 813. The bulk of the growers supplying Mr. Heck's Mill, of Rocky Point, are now planting this cane. It is not only high in sugar, but shows considerable disease resistance. Some farmers have small areas of H.Q. 285. Other local names for this valuable cane are "Early Maturing," "Nerang," and "Milton's."

Regarding pests and diseases, no serious losses were reported by the growers from these, although as mentioned above, what the writer takes to be an infection that may prove serious if not watched, was located. The following is a description:—

The diseased shoots will grow a foot or so and will have a number of healthy looking leaves when suddenly they will lose their capacity to grow normal leaves, and throw out a few bent and twisted ones. Some of the eyes may shoot, but they soon become twisted like those on the main stem. An examination of the leaves will show a number of long galls on the underneath side of the leaf. On splitting the cane small galls can be found on the vascular bundles. Practically all the leaves bear these galls.

The farmers are recommended to plough out and burn the affected stools and get plants from an absolutely unaffected area. No time should be lost in destroying affected stools. No plants should be sent from these areas to others, until the disease has completely disappeared.

A new cane pest has been discovered—the fox. One grower pointed out where it had gnawed several sticks.

The Use of Potash on the Woongarra Red Soils at Bundaberg.

Following the successful experiments with potash on the red soils of the Sugar Experiment Station at Bundaberg, in the Woongarra sub-district, further trials were made last year with this fertiliser.

The application of potash alone was continued on a third ratoon crop, the heaviest dressings being at the rate of 300 lb. of muriate and sulphate of potash per acre. The cost of the fertiliser and its application was £2 5s. per acre.

The increase in the tonnage of cane per acre for this application amounted to 6.57 tons. This was not so high as in the second ratoon crop, but the climatic conditions were not too favourable. This return, however, was highly remunerative.

From a mixed manure, containing a fairly heavy dressing of potash, applied to first ratoons, and consisting of 100 lb. sulphate of ammonia, 100 lb. of muriate of soda, 200 lb. sulphate of potash, and 200 lb. of meatworks fertiliser, an increase of 10.42 tons of cane per acre was secured over the cane which received no manure.

It was evident from analyses of these red soils that the potash content was low, and the use of this element warranted, although it is not contended that dressings of potash alone will always give higher results than mixed fertilisers, upon the red soils, but it is believed they will do so at first, and proof of this is found in its successful use on many farms in the Woongarra district, latterly.

On the Northern alluvial soils where the available potash is higher, potash alone would not give such an increase in yield.

The Northern Field Assistant, Mr. A. P. Gibson, reports 23rd February, 1926:—

MOSSMAN.

The mill and its dependent township is situated some four miles in a direct line from what is now left of the old but one time important town of Port Douglas.

The sugar land is somewhat broken, is purely coastal, and is bounded on one side by a rugged, densely wooded high range. Proximity of this to the sea generally ensures a beneficial rainfall. The soil is mostly scrub or forest alluvial deposits; as a rule it is not deep, and varies in texture from light silt to a coarse decomposed granite.

Rainfall.

The annual rainfall is over 86 inches; last year the average was exceeded by fully 21 inches. This fine rainfall, coupled with suitable humid conditions, is most conducive for rapid crop growth, hence a satisfactory tonnage of cane having a good quality is raised. The four centres from which the factory receives its supply, with their respective areas harvested and tonnages, are:—

Centre.	Acreage Harvested.	Tons Crushed.
Mossman	2,421	39,658
Miallo	1,533	16,604
Mowbray	638	13,025
Cassowary	884	10,989
Total	5,476	80,276

Unfortunately, these lands are scattered, necessitating the construction of many bridges, lengthy 2-feet permanent tram lines, miles of which pass through stretches of non-producing sugar land. Such districts require more rolling-stock, greater supervision, and maintenance, all of which naturally increases the cost of transportation and manufacture. The mill had its maiden run twenty-nine years ago. In the year 1906 it treated 103,291 tons, its greatest cane tonnage, making 10,421 tons of sugar. Cane was then grown on the steep virgin hillsides. Now it is wholly confined to the lower levels.

Year.	Tons Cane per Ton Sugar.	C.C.S.	Extraction.	Tons Cane per Hour.
1906	9·91	12·25	89·7	27·4
1925	7·64	14·20	94·7	32·1

The extraction would have been better, but owing to a mishap two sets of mills instead of three were in use for a time. The increased recovery is due to installation of more modern machinery, superior cane varieties, and better husbandry. Further improvements are under way.

Mossman is the only Northern mill that has not had a sufficient supply of cane, nor does there appear land convenient enough to raise the much desired seasonal requirements of some 130,000 tons. When Australia was called upon "to produce"—Mossman did its best. The price offered at the time made it worth while to bring in the poorer land as well as the richer. Tramways were extended, the factory was modernised and its capacity increased to meet the expected additional supply. A change has taken place, sugar and cane prices have declined, and in consequence the inferior and distant lands will again be placed out of bounds for profitable cane culture, less fertilizers will be used, all of which must result in a reduced seasonal tonnage. It is said the one remaining hope of insuring a profitable crop on the present face of things, and for which the management is agitating, is the extension of the tram line about 13 miles to the Daintree River area.

Cane Varieties.

Many varieties are raised, the principal with particulars are as follow:—

Varieties of Cane.	Area under Crop.	Percentage.	Percentage c.c.s.
H.Q. 426 (Clark's Seedling)	1,241	22·66	14·84
Q. 813	45	·82	14·72
N.G. 15 (Badila)	1,125	20·55	14·66
M.Q. 1 (Badila Seedling)	98	1·79	14·60
B. 147	667	12·18	13·82
Goru	211	3·85	13·64
D. 1135	1,635	29·86	13·62
M. 189 (Black Innis)	85	1·55	13·31
Mixed	369	6·74	13·62

Others which are grown on a small scale show the following analyses:—Q. 903—14.65 c.c.s.; H. 109—14.40; E.K. 28—14.15; Q. 855—13.66.

Planting.

Some growers still deposit whole canes in the drills and cut them into sets as they lie before covering. This is unsatisfactory as pests and diseases escape notice. Apparent lack of supervision at time of planting is most marked, unfortunately resulting in the wide distribution of the diseases known as Leaf Stripe and Leaf Scald. It is highly probable that the former has been aided by (1) the widespread custom of growing the same stock variety continuously in the same soil; (2) careless selection of plants and subsequent inferior cultivation, the foregoing weakening the variety to such a degree that it simply cannot survive the attack of the organism connected with the disease. Soaking sets prior to planting is common here; this develops the eyes rapidly and speeds up germination, more especially if the water is warm. The time of immersion varies from twelve to twenty-four hours. When the soil is moist and in good mechanical order this operation is hardly necessary. Too great a time in the water is harmful, one farmer tried dipping in salt water and reports success. Some growers are transplanting stools of cane into empty spaces in plant cane in preference to planting sets; when the weather is favourable it is a good plan.

Great care should be exercised when planting B. 147 and M.Q. 1. They are badly infected with Leaf Stripe disease. D. 1135 and H.Q. 426 are good and suitable canes for medium soils, but the latter is very susceptible to disease. N.G. 15 (Badila), although having Leaf Scald disease seems at present to be one of the freest varieties from disease in the district. Where the soil is rich and deep this should be grown.

Q. 813 and E.K. 28.—The growing of these canes on the poorer soils should be extended; when grown on too fertile soil the former grows rapidly and lodges, resulting in a reduced c.c.s., higher harvesting rates, and light trucks. 7 R. 428 (Pompey) probably would do well on the poorer soils.

Pests and Diseases

Rats, grubs, wild pigs, and wire-worms have been responsible for great crop destruction. The banks of the many ever-flowing creeks and depressions intersecting the farms contain much undergrowth and prolific crops of Panicum and other grasses and are jumping off places for the rat, besides protecting them from their natural enemies. The controlling of this pest is of immense importance. We can only hope to bring this about by the hearty co-operation of those concerned in (1) systematic poisoning; (2) clean farms, more especially headlands; (3) fencing off where possible the non-producing areas, thereby permitting the ingress of stock.

Fully grown ''frenchi'' grubs had destroyed some 10 acres of D. 1135 plant cane on the Bri Bri Estate.

Wild pigs raid the cane fields in isolated patches and are quite capable of causing much damage in a short time.

Wire-worms are sometimes responsible for sets not germinating. Depoliated patches of cane were observed when passing through the Mowbray area by rail motor; this appeared to be the result of grasshoppers.

Small patches of Aphis Sacchari and Sooty Fungus were seen. There is little cane stem showing yet, in consequence borers were not noticed.

Leaf Stripe (Downy Mildew) and Leaf Scald are widely distributed, more especially in ratoon paddocks having the varieties B. 147 and M.Q. 1. The more seriously affected fields should be ploughed out and subsequently limed. Unfortunately, lime is scarce and the price delivered makes it almost prohibitive. Farmers are advised to watch plant crops closely and to remove any affected diseased stools that may appear.

Leaf Scald was located, more especially in H.Q. 426 and N.G. 15.

Fertilisers.

The value of the various manures purchased by the mill for the farmers last year was £17,087. This consisted principally of meatworks, B_3, and ammonia. The manure is applied at various rates per acre, some prefer placing it in cane drills at time of planting; others delay the operation until the cane is established. Surface dressings unfortunately are too often applied to grassy cane lands; in such instances the grass not the cane derives the benefit.

Green Manuring.

Cowpea and Mauritius bean are grown in a small way. Corn, where grown, was badly affected with Mosaic disease.

The 1926 Crop.

At the beginning of the present growing period, dry weather prevailed, followed by many light showers which only revived the cane but promoted weed growth to such a degree that it temporarily overmastered the cane growth. Later, splendid rains fell when the cane soon outgrew the intruding weeds, but still leaving many of the paddocks dirty.

The prospects for the coming season are promising, parts of Saltwater and the Mowbray are backward. However, it is at present thought that last year's tonnage will be overshadowed.

The mill is capable of treating a greater tonnage of cane than it has been receiving and the management is out to acquire it if possible.

Extension of Railways.

The line is to be extended another 46 chains in the recently opened up Whyanbul Creek area before the season commences. The formation is completed and the rails are lying alongside in readiness for placing.

SEPARATION AND THE SEPARATOR.

By CHARLES McGRATH, Supervisor of Dairying.

The variations of the butter fat content of the cream forwarded to butter factories is frequently a cause of dissatisfaction to the producer. Many cream suppliers state that their method of cream production does not allow of fluctuations in the butter fat content of the cream. Such fluctuations do arise from various causes. Producers can control to a great extent the conditions that ensure the production of a cream of a uniform composition and character.

The separator must have a solid rigid foundation and be quite level to ensure satisfactory creaming results, and to prevent the machine getting out of repair owing to the wearing of the spindle and bearing on one side.

The separator must be in good running order and properly lubricated with approved oils. A separator is not doing efficient work, unless it is running smoothly.

When the separator bowl revolves at the correct speed and is not vibrating or jarring, the cream is separated by the centrifugal force and is delivered into the cream pan.

When the separator bowl vibrates a portion of the cream becomes remixed with the separated milk, and is then carried away with the skim milk.

The speed of the separator bowl has a direct influence on the butter fat content of the cream. By increasing the speed of the separator bowl the fat content of the cream delivered is raised.

If the separator bowl is run below normal speed the fat content of the cream delivered is lowered, the separation of the butter fat is not thorough, and a loss occurs owing to an amount of fat being left in the skim milk.

When belt-driven separators are used, see that the belt adjustment is correct. When the belt is too loose slipping takes place, causing irregularity in the speed of the bowl and unsatisfactory skimming. If the belt is too tight the separator bearings become heated with resultant injury to the machine.

The position in which the cream screw is set influences the fat content of the cream. A slight turn of the screw will cause a variation of the cream test.

The cream screw should grip firmly in the thread of the bowl so as to prevent any movement in the screw owing to vibration.

The fat content of the cream must always be regulated by adjusting the cream screw. Do not endeavour to vary the fat content of the cream by running the separator faster or slower, or by decreasing or increasing the supply of milk to the separator bowl. Such practices prove most unsatisfactory, and result in loss of fat into the skim milk or injury to the machine.

Always run the separator at the correct speed and provide for a regular supply of milk in accordance with the stated capacity of the machine.

The use of the float ensures a regularity in the flow of milk into the bowl, an essential condition in securing efficient skimming. When the supply of milk to the separator bowl is delivered by a float process from a correct feed adjusting tap, the regularity is affected in a small degree, by the change of pressure due to the varying quantity of milk held in the supply vat, and by varying temperature of the milk treated. The higher the temperature of the milk, all other conditions being the same, the greater quantity will flow through the delivery tap.

The temperature of the milk at the time of separation has a decided influence on the fat content of the cream produced.

A suitable temperature for the separation of milk is approximately 90 degrees Fahr. If the milk is below 75 degrees Fahr. at the time of separation, the process is not complete, and a high percentage of fat is left in the skim milk.

It is advisable to separate the milk as soon as possible after it is drawn from the cows at a temperature approximately 90 degrees Fahr.

If milk is separated when at the lower temperatures the cream produced will have a higher fat content than if the milk was treated at the suitable temperature of 90 degrees Fahr., and there will be an increase of fat in the skim milk.

During the winter months the milk cools quickly, and in the process of separating enters a cold bowl which chills the first of the milk and cream. The bowl may be warmed by running some warm water through previous to use.

Variation in the fat content of milk at different periods of the season causes a variation in the fat content of the cream produced. The cream from the higher testing milk will have a higher fat reading than cream from milk of a lower fat content when separation takes place under exactly similar conditions.

The physical condition of the milk treated has an influence on the efficiency of the process.

Viscous, slimy, ropey, fermented, and partial coagulated condition of the milk gives unsatisfactory skimming results, causes a loss of fat in the skim, and delivers a low grade cream.

The capacity of the separator bowl in relation to the quantity of milk separated during the one operation has a direct influence on the fat content of the cream, and the general efficiency of the process of separation.

When a large quantity of milk is treated by a machine of a relative small capacity the gradual accumulation of bowl slime fills up the space between the discs within the bowl, and the space between the bowl and the discs reducing the bowl's holding and separating capacity.

The inflow of milk is gradually becoming greater than the skimming capacity of the slime-clogged bowl, resulting in the delivery of cream with a lower fat content, and causes a loss of fat which is carried away in the skim milk.

When a large quantity of milk has passed through a bowl it is at times noticeable that the flow of cream becomes irregular.

The separator should be stopped and the slime removed from the bowl, when the work can be resumed with satisfactory results.

When the whole milk is not properly strained before separation the amount of bowl slime is greatly increased. A separator of a large capacity will last longer than one of a small capacity. The larger machine will work for the shorter period in treatment of a similar quantity of milk.

Some years ago the hand separators of larger capacity were heavy to turn, but the large capacity hand machines of to-day are as easy to turn as the smaller machines on the market a few years ago.

The amount of water used in flushing the bowl influences the cream test. Too liberal a supply lowers the fat content of the cream.

The condition physical and otherwise of the cream delivered at the factory has an influence on the accuracy of the determination of the butter fat content.

The sampling and testing of cream is unsatisfactory, and the grade is generally low—

1. When the undesirable practice is followed of separating the cream into a can or receptacle containing the cream from a previous separation.
2. When cream is not stirred thoroughly after separation and at subsequent intervals.
3. When cream of varying temperatures is mixed and the blending is incomplete, the body of the mixed cream showing clots or lumps.
4. When cream is fermented owing to the presence of yeasts.
5. When cream is partly churned in transit.
6. When cream is viscous, slimy, ropey, or curdled.

During the winter months cream containing 40 per cent. butter fat and over delays the sampling owing to its heavy body.

Cream properly separated and handled and having a butter fat content of 40 per cent. to 42 per cent. in the summer period, October to March, and 36 per cent. of butter fat during the winter months, April to September, if properly handled on the farm and regularly delivered, will generally reach the factory in a condition that facilitates sampling and testing. It will be of a higher grade than cream produced under conditions that make for varying butter fat content, which is frequently associated with irregular and uncertain grades.

INFLUENCE OF COMPOSITION OF FOODS ON THE HEALTH OF STOCK.

By J. C. BRÜNNICH, Agricultural Chemist.

The Cloncurry and Winton District Branches of the United Graziers' Association suggested investigations on the following questions:—

(*a*) Why stock thrive so much better in some localities than in others;

(*b*) Why the lambing and calving are so much more prolific in some localities compared with others;

(*c*) Why stock thrive so much better on green food than they do on similar dry food;

(*d*) To determine if it is commercially possible to artificially supply the absent—or nearly so—soluble mineral matters; and

(*e*) The most profitable method of supplying same.

The proposed investigations are undoubtedly of the greatest importance to all our stockowners, but do not apply to Queensland alone, but to the whole world.

The same problem is now seriously taken up by the Committee of Civil Research in England, and a questionaire in connection with the mineral contents of pastures has been sent quite recently to all the Dominions. The problem is intimately connected with our own, and a copy of the preliminary report of the sub-committee is appended.*

In connection with this subject a valuable and interesting paper was read at the 1921 meeting of the Australasian Association for the Advancement of Science, by E. Murphy, Dairy Supervisor, Victoria, entitled "The Health of Live Stock. Notes on soils and pastures." Many interesting facts and suggestions are mentioned in this paper, of which the following are quoted:—

"I do not underrate the baneful effects of over-stocking, but wish to stress the fact that the killing out of the deep-rooting grasses throws the burden of stock carrying upon the superficial layers of the soil, which quickly become depleted."

Again, in the above paper, mention is made of a farm which forty-five years ago was free from disease, and that then the surrounding district was covered with white clover, and that there is now no white clover to be found, and the farm in question has become very unhealthy.

"Heavy losses have occurred on this farm and throughout the district from cripples and paralysis in cows and in sheep, &c."

"The Department of Agriculture conducted some manurial trials on portion of the dairy farm mentioned above. Lime and superphosphate gave the best results. Ten hundredweight of lime and 2 cwt. of superphosphate were applied per acre in 1918 and again in 1919. Samples of the manured and unmanured vegetation were analysed. The results throw a flood of light upon the necessity for maintaining an adequate supply of mineral nutrients in the pasturage for lactating animals. On the food supply grown on the manured land the animals thrive, on the other they die.

CHEMIST'S REPORT.

	No. 1. Area untreated. Per cent.	No. 2. Area treated with lime and super. Per cent.
Total ash	7.19	7.17
Protein	5.55	10.25
Crude fibre	32.37	28.36
Carbohydrate	52.21	51.37
Fat	2.68	2.85

Analysis of the Ash.

Phosphoric acid	0.14	0.33
Potash	0.84	1.70
Lime	0.42	1.06
Magnesia	0.18	0.27"

*Copy of this report will appear in our next month's issue.

The problem is also dealt with in a most exhaustive manner by the Chief Veterinary Surgeon of New South Wales, Mr. Max. Henry, M.R.C.V.S., in an article, ''The Influence of the Mineral Constituents of Food on Animal Health,'' which appeared in the ''Agricultural Gazette'' of New South Wales, December, 1925, and in which several curative measures were suggested.

The following well known facts have a fundamental bearing on the questions raised:—

1. Under primeval conditions, nature maintains, by working in everlasting cycles, aided by the external forces of light and heat supplied by the sun, an exact balance between soil, vegetable, and animal life, which is liable to an exceedingly slow change during æons.

2. Man's interference with nature's laws, by increasing production in any direction, removing the products and even destroying some of the factors, upsets the balance of nature to the detriment and exhaustion of the soil.

3. The nutrient value of foods shows very wide variations, according to soil, seasons, and locality.

4. The food value of the crop also varies with the age—it generally increases towards the flowering stage and decreases with ripening.

5. There are five classes of nutrient constituents in foods, every one of which much be supplied in necessary adequate amounts. Each nutrient has certain functions, which, however, to some extent overlap with those of others:—

- (*a*) Proteins, nitrogenous organic compounds which produce animal tissue, flesh, and muscles;
- (*b*) Fats; and
- (*c*) Carbohydrates, organic compounds composed practically of carbon and water, which build up fatty tissues, and produce and maintain the animal heat;
- (*d*) Mineral salts, entirely obtained from the soil, are absolutely necessary for the formation of bone, they aid in the building up of all animal tissues, production of milk, wool, &c., and are indispensable aids in the process of digestion;
- (*e*) Vitamines, or accessory foodstuffs, present in minute quantities, but absolutely necessary for the maintenance of health and normal development of all the higher animals.

6. Lack or deficiency of any one of the nutrient constituents causes starvation or malnutrition, ill health, and predisposes the animal to a large number of diseases, and more particularly is fatal in the stages of reproduction.

The most abundant constituent of all stock foods are the carbohydrates, which are produced in the leaves of plants from the carbonic acid in the air by the aid of sunlight. In this process of assimilation or carbon fixation, the presence of minute amounts of mineral salts, particularly lime, magnesia, and potash are also absolutely necessary. Well known carbohydrates are starch, sugars, gums, cellulose or fibre, fats, oils, and waxes.

The most valuable nutrients are the proteins which are most complex organic compounds containing carbon, oxygen, hydrogen, nitrogen, and sulphur. Protein is the essential constituent of the protoplasm, a peculiar slimy jelly-like substance found in the plant cells, and in solution in the plant sap, and nearly always associated with small amounts of phosphoric acid in form of phosphates. Proteins are largely stored up in the seeds of plants, more particularly in the seed of cereals (wheat, rye, barley, &c.), of legumes (peas, beans, &c.), and oily seeds (nuts, cottonseed, linseed, &c.). In the fodder plants the amount of protein varies very largely, not only the amount is very different in the various classes of fodder plants, but in each species the amount varies according to stage of maturity, classes of soil, climatic conditions, &c.

For years numerous fodder analyses have been carried out in our Agricultural Laboratory, and in the yearly reports of 1909, 1912, 1914, analyses of all kinds of fodders, grown in many localities and cut at various stages of growth, have been reported and are of great interest. For instance, our celebrated Mitchell grass shows a variation in the protein content, calculated on the water free material, from 3.33 per cent. to 8.76 per cent. The highest amount was always found in mid-growth, and the lowest in the mature grass. In Rhodes grass we find an even greater variation from 3.45 per cent. to 12.12 per cent., and in Prairie grass, unquestionably our most valuable winter grass, amounts from 10.05 per cent. to 25.90 per cent.

Quite recently we received a sample of Mitchell grass hay from a locality in the Longreach district, where very heavy losses of lambs and sheep were experienced. On analysis we found only 2.1 per cent. of proteins, which is lower than found in

the poorest of bush hays, and one of the causes of the losses is without doubt protein starvation.

In all our natural pastures edible herbs and shrubs are a valuable addition to the grasses, and the analyses of such edible plants found in the Maranoa district, which were published in the annual report, 1918, show the great nutritive value of a large number of these plants. Many of these herbs and bushes, more particularly those belonging to the leguminous plants, contain very fair amounts of proteins, or flesh forming nutrients.

It is, however, not only the composition of the fodder which determines its value as a food, but of equal importance is the digestibility of the various nutrient constituents, and furthermore the palatableness of the fodder must also be taken into consideration. The digestibility of any fodder is influenced by the age of the crop, the conditions of growth, the treatment of crop at the time of harvesting, and lastly depends to a large extent on the animal itself consuming the food.

Succulent green fodders are not only more palatable, but are more easily digested. The process of hay-making, and also making of ensilage, always lowers the digestibility of the nutrients, combined with losses of vitamine.

The mineral constituent of foods, although generally present only in small amounts, are of the most vital influence for the normal development of the animals and maintainance of animal health.

The actual chemical elements forming these mineral constituents are absolutely necessary to the animals, in order of the required amounts, are:—Calcium (Ca.), Phosphorus (P), Sulphur (S), Chlorine (Cl), Potassium (K), Sodium (Na), Iron (Fe), Magnesium (Mg), Fluorine (F), and traces of Silicicum (Si), Manganese (Mn), and Iodine (I).

The first two more important elements, calcium and phosphorous, exist in combination as calcium phosphate, the chief component of the bones. Chlorine and sodium form the well known common salt, sodium chloride. Sulphur is always found in small amounts in proteins; wool fibre, for instance, contains 17 to 19 per cent. of nitrogen and 3 to 5 per cent. of sulphur. Potash again is of particular importance to sheep, as in 1,000 lb. of raw wool we find 90 lb. of potassium carbonate and 6 lb. of potassium chloride.

All the mineral constituents must be supplied by the soil in a readily available form to the fodder plants, and naturally if the soil is deficient in any of them, the fodder plant must be also lacking the same constituents. Very much larger amounts of the mineral constituents, than actually required, must be consumed by the animal, as only a comparatively small amount of the mineral constituents is utilised and the remainder is voided with the excreta.

Phosphate of lime is not only necessary for the bone formation, but is necessary for the building up of all animal tissues, and production of meat, milk, and wool. The female animals, particularly during the periods of pregnancy and lactation, require large amounts of phosphate of lime. If a pregnant animal gets only food lacking in phosphate of lime, the phosphates necessary for the fœtus are drawn from the animal's own bones, which become more and more porous and brittle.

In all vital processes, the mineral salts play an important part, and deficiencies cause malformation of bones, digestive troubles, sterility, general decrease in health and vigour, predisposition to worm infestation, and other diseases. Full details on these matters are given in the papers already referred to.

Before the effects of malnutrition, like bone chewing, depraved appetite, malformation, paralysis, digestive troubles, &c., become too pronounced, curative measures must be taken.

The addition of bran and pollard, oil cakes, and lucerne to the ration will be found beneficial. A supply of green fodder, grown on a richer or a well manured soil, will be useful, as it not only supplies the mineral salts, but the necessary vitamines.

The supply of licks containing salt and bonemeal, or the addition of such in small amounts to the rations of hand-fed animals, gives good results, and the effects become noticeable in a very short time. One part of fine bonemeal mixed with one to two parts of coarse salt makes a good lick. The bonemeal must be specially prepared and sterilised for this purpose, and ordinary bonemeal used as fertiliser should not be used. An excellent substitute for bonemeal is finely crushed Nauru phosphate, as it contains much larger amounts of phosphoric acid and lime than bonemeal and is just as easily digested by the animal, and cannot carry disease germs like bonemeal. Excellent results by the use of Nauru phosphate have been reported from many of the dairying districts in New Zealand, and already good reports have been received from some of our sheep owners who have used it in form of a lick on our recommendation.

Wherever practical, the top-dressing of the pasture with phosphatic manures, practised very largely in many parts of the world, gives excellent results, and cattle pasturing in such paddocks instinctively rush for the portions on which phosphates have been applied. If it is not possible to fertilise the whole grazing areas, smaller paddocks may be treated and used as nursery paddocks for sick stock.

The actual amounts of mineral matter required by sheep are very small, a full-grown wether 2 years old, with about ½ lb. of potash in the wool, 1 lb. each of lime and phosphoric acid in carcass, and about 2 lb. of nitrogen in carcass and wool, requires annually in the food about 7½ oz. of lime and ¼ oz. of phosphoric acid. A breeding ewe naturally requires more, but these amounts of mineral matter should be easily supplied even by the poorest of pasture.

I cannot help remarking that I consider the trouble of malnutrition to be more a protein starvation than lack of mineral salts, or more likely a combination of the two, and due to the inherent poverty of the soils in those districts where the trouble exists.

It is of interest to repeat here a table of the mineral constituents found in the soil in some of the districts already reported elsewhere, and state that the amounts of mineral constituents given are the actual total amounts, of which only a very small proportion is actually readily available to plant life, which will easily account for the difference in the value of these places for sheep-breeding. We find in the soils from:—

—	Lime.	Phosphoric Acid.	Potash.
	Per Cent.	Per Cent.	Per Cent.
Comet Downs	·23	·05	·17
Cunnamulla	·21 to 1·5	·04 to ·06	·03 to ·76
Mount Windsor Tableland	·10 to ·40	·06 to ·12	·07 to ·22
Winton	·58	·09	·35
Emerald	·20 to 1·3	·04 to ·10	·20 to ·40
Longreach	1·20	·10	·30
Blackall (Isis Downs)	4·00	·10	·46
Peak Downs	4·40	·40	·40
Barcaldine	·08 to 1·0	·02 to ·04	·14 to ·27

In a previous paper on the problem of closer settlement in the Maranoa district, by combining sheep-breeding with wheat culture, I made the following calculations:—

As a basis for such a scheme, we will take a well-established farm of 1,280 acres, on which it is recommended to have always about 200 acres under wheat, 200 acres fallow, and breaking up new ground as required every year, so that every acre of the land will only be once every five years under wheat. On the farm a flock of 600 merino sheep could be pastured, of which annually 200 head are sold as store sheep and lambs, and also a yearly wool clip of about 8 lb. of wool per head should be obtained.

—	Nitrogen. N.	Potash. K_2O.	Phosphoric Acid. P_2O_5.	Lime. CaO.
15 bushels of wheat, remove per acre lb.	19	5	7·5	·8
Wheat removes from 200 acres lb.	3,800	1,000	1,500	160
200 Merino sheep, at 70 lb. live weight, remove lb.	333	24	167	185
4,800 lb. of wool from 600 sheep remove lb.	260	271	3	9
Total constituents removed annually lb.	4,393	1,295	1,670	354
Removed per acre (for whole 1,280 acres) lb.	3·43	1·01	1·30	·28
Sheep excreta supply per acre lb.	3·6	3·7	1·2	1·0
An average rainfall of 26 in. supplies lb.	3·7	..	..	..
If *wheaten hay* or straw is sold :				
35 cwt. of hay remove per acre lb.	67	69	16	10
Wheat straw, 25 cwt. per acre, remove per acre lb.	11	35	3	6

From this table we learn that the sheep remove only very small amounts of mineral matters per acre, on such lightly-stocked farms, and only when the wheat grain, wheaten hay or straw or other crops are sold, much larger amounts of mineral matters are taken from the soil. Sheep must, of course, receive in their rations much more mineral matters than theoretically required, and, therefore, with coarse, poor food, deficient in proteins and mineral matters, they could not consume sufficiently in a day's feed to supply the necessary amounts. How much more of the constituents are consumed is clearly shown by the large amount returned to the soil by the excreta per acre.

It is a well known fact that sheep-grazing on fallowed lands, improve the land, by returning large amounts of easily available plant-foods in the dung, which is spread fairly evenly over the land, and well trampled in by the sheep. With a light stocking with only one sheep for two or more acres, the amounts removed are practically negligible, and only on soils originally very poor in lime, phosphoric acid, and potash, a depletion may become apparent and appreciable in the course of time.

Intimately connected with the subject is the problem of the renovation of paspalum pastures, as in practically all our coastal districts it is becoming more and more apparent every year, that there is a serious falling off in the food obtained from such pastures, both in quality and quantity.

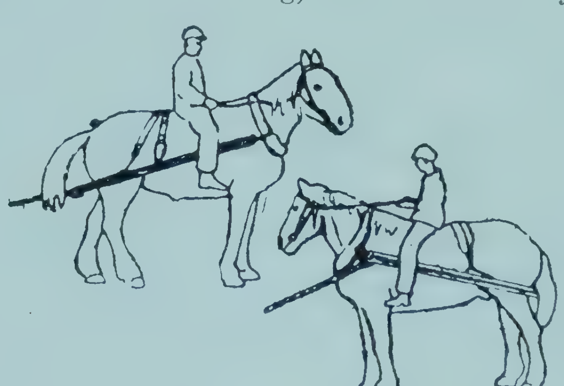
Experiments dealing with this problem have been started by the Department of Agriculture and Stock in several localities: Maleny, Cooroy, and Runcorn. Naturally some considerable time must elapse before such experiments can reach finality, but already there are strong indications that a good breaking up of the paspalum sod by ploughing and harrowing, combined with the application of artificial fertilisers will yield wonderful results.

With regard to our Western pastures, the investigation started over twelve years ago should again be seriously taken up and the co-operation of stock inspectors and stock-owners in securing good average samples of pasture crops from normal and abnormal localities, at various periods of growth, and submitting the air-dried samples for analysis, is necessary for the scheme. Of course such sampling must be done for several years in order to allow for local and seasonal variation in the crops already alluded to in this paper.

In conclusion I must state that the perusal of the foregoing remarks shows distinctly the influence of food on the health of stock, and it is therefore the duty of all stock-owners who experience any trouble, to make experiments on a small scale, not only by using additional concentrated foods when urgently required, and giving a liberal supply of licks recommended, but to make trials, if only on a few acres, for the improvement of the pastures by top-dressing with artificial fertilisers.

A CONVENIENT HITCH.

A convenient hitching arrangement for pulling up the hay fork when stacking hay or hoisting bags of wheat or hoppers of maize is shown in the illustration from "Popular Mechanics." It consists of a U-shaped rig, made from two round iron bars, and held in place by the collar and a hip strap. The rope to the hay fork is looped on the lower branch of the rig, and slides readily around it when the



horse turns. There is no swingletree to bump against the horse's heels, nor anything for the driver to hold up on the return trip. The left-hand illustration shows the horse going out with a load, and the right-hand one shows him starting back for another trip.

PASSION FRUIT CULTURE.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

No recent publication dealing with the culture of this fruit having been issued by this Department, it is considered desirable to bring out a new pamphlet dealing not only with the well-known passion fruit *Passiflora edulis*, but with the less known fruits, varieties of the same natural order "Passifloreæ," that can be grown here, such as the Granadilla, *P. quadrangularis;* the "Bell Apple," *P. laurifolia;* the Meixcan Passion Fruit, *P. ligularis;* and the Banana Passion Fruit, *Tacsonia mollissima.* Other varieties of the same natural order are grown for the sake of their flowers and foliage, and the papaw, "Carica papaya," is a very near relative.

All passion fruits are climbers, and the varieties above referred to are either semi-tropical or tropical, and require a well-drained, friable, rich sandy loam soil to be grown to the best advantage; but the common passion fruit can be grown on comparatively poor soils that are naturally well drained, provided they are systematically manured, well cultivated, and are not subject to severe frosts. Stagnant water at the roots is fatal and very heavy soils should not be selected.

As with all other fruits the land should be thoroughly prepared prior to planting, so as to reduce it to a state of perfect tilth, and provide the right soil conditions in which to start the young plants. This is a matter of very great importance, and one that does not receive the attention it should, as not only passion fruit but all other fruits are frequently planted in land that is very far from being in good order, and which should have received much more care and attention in order to enable it to produce healthy vigorous plants that will yield payable returns. Slovenly work is never a success in any branch of fruit culture; and nothing is "good enough" except the best; in fact, as far as the fruit itself is concerned, the only fruit in which there is any profit is "the best."

Passiflora edulis—Purple Passion Fruit.

This variety is the one that is most commonly grown, not only in Queensland but throughout Australia. There are at least two types, the large fruited or "giant" passion fruit, sometimes called "Mexican," which attains a size of over two inches in diameter, and the common type which averages about 1¾ inches in diameter. The former, though a larger and more showy fruit, is somewhat disappointing, as it is frequently a shy bearer and the fruit does not contain as large a percentage of pulp as the common type, which is the best all-round commercial fruit. The best fruit has a very dark purple skin, which is filled with an orange-coloured pulp in which the seeds are imbedded. The pulp is slightly sub-acid and possesses a very distinctive agreeable flavour, so that when used as an ingredient of a fruit salad it imparts its characteristic flavour to it, and the salad is greatly improved thereby.

The plant is easily propagated from seed, all that is necessary being to select perfect fruit, fully mature, from a perfectly healthy plant that is free from leaf, root, vine, or fruit affection of any kind. The pulp, when removed from the fruit, should be placed in a tub or suitable vessel, and be covered with water, the mass being then allowed to ferment long enough to free the seeds from the pulp, when they should be strained off, well washed, and dried. If early spring ripened fruit is selected and the seed is planted as soon as ready, good strong plants will be available for summer planting, but if plants are wanted for early spring planting the seed must be sown the previous autumn. The seed should be sown in a specially prepared seed bed in soil of a light, free nature, containing a quantity of leaf mould or humus—a good potting soil—and the young plants should be sheltered from the sun and judiciously watered should the soil become dry. When the seedlings are about one foot high or larger they should be planted out in the permanent position, taking care to keep them moist so that they will not dry out.

Prior to planting, the land is marked off in rows not less than ten feet apart. A trellis consisting of good fencing posts, placed fifteen feet apart in the row, is erected along the row, the posts being set with their width across, not in the direction of the row. The posts should be about 8 inches wide by 3 inches thick by 6 feet 6 inches long, and be set 18 inches in the ground and 5 feet out of the ground. The end posts must be much heavier and be well strutted as they have to act as strainers, and prevent the wires that are attached to the top of the posts from sagging when they have to carry a heavy growth of vines. Two No. 8 galvanised

wires are firmly fixed to the top of the posts, one on each side, so that when in position they form two parallel lines, 8 inches apart, on which the vines are trained. The young plants are planted midway between the posts, right under the wires, and are tied to a light stick or other temporary support till they reach the height of the wires, when they are topped and two main lateral stems are allowed to develop, all other lateral growths on the main stem from the ground to the wire being removed. The two main laterals are then trained on to the wires, and when they meet those of the adjacent plants their growth is stopped by pinching back the terminal growth, which causes secondary laterals on which furit is borne to be thrown out all along the main lateral. These secondary laterals, if left alone, throw out further laterals and these again in turn make more lateral growth, with the result that a very dense and tangled growth of vines is produced from which it is hard to separate the primary and secondary laterals and which, owing to its dense habit of growth, is frequently prone to be attacked by disease. Systematic pruning is therefore desirable—first to keep the plants healthy, secondly to produce strong new lateral growth on which good fruit will be grown, and thirdly to bring in the crop at different periods of the year, so as to get a better distribution of the crop instead of a glut at one time and a scarcity at another. When an autumn or winter crop is desired the main summer crop must be sacrificed. This is done by pruning the vines right back to the secondary laterals when they are showing their blossoms for the summer crop, and this will have the effect of throwing out a new growth which will blossom at a later period. A word of warning is, however, necessary; don't prune hard back in dry weather—you will probably kill the plants if you do so—but wait till the ground has had a good soaking, when the plants will throw out a fresh growth very quickly and will not be permanently injured. A good dressing of quick-acting manure at this time will be found beneficial and materially increase the following crop.

Mr. Brünnich, in his last edition of "Complete Fertilisers for Farm and Orchards," recommends the following manure for passion fruit:—

> "Use per acre, in accordance with the richness of the soil, a mixture of—1 to 2 cwt., nitrate of soda; 4 to 8 cwt., blood and bone manure; 1 to 2 cwt., superphosphate; 1 to 2 cwt., sulphate of potash. A top dressing of 1 cwt. of nitrate of soda in spring will be found beneficial."

This is a complete manure rich in organic and inorganic nitrogen, citrate and water soluble phosphoric acid as well as potash, and should not only act quickly but be fairly lasting in its effect.

The passion fruit is liable to be attacked by several different pests of which the leaf disease is by far the most serious. This disease has only made its presence felt during recent years, and so far no remedial measures have been found very efficacious. The disease is of an obscure nature and attacks every part of the plant above ground—the flowers, leaves, and laterals. The latter are killed by a small portion of the stem becoming affected to such an extent that it dies and all the rest of the lateral that is beyond the part attacked shrivels and dies, frequently when it is covered with fully grown but immature fruit which shrivels up. The affection is receiving the careful attention of the Vegetable Pathologist, and it is hoped that the result of his investigation will throw some light on the best means to be adopted to keep it in control, if not do away with it altogether. Red spiders and spinning mites frequently injure the leaves and young laterals. These pests can be kept in check by spraying with sulphide washes or dusting with finely-ground sulphur.

Scale insects of various kinds also attack the wood, leaves, and fruit. These may be kept in check by systematic spraying, but this can only be effectual when the vines are systematically pruned, as when grown in a dense mass the spraying material used has little chance to come in contact with the majority of the insects.

Nematodes injure the roots, and here the use of materials that can be injected into the soil such as paradichlorobenzene are well worth taking. Fruit fly also attacks the fruit, as does also a sucking bug. The latter sometimes causes a heavy loss, as the punctured fruit either drops or if it remains on the vine becomes hard and woody. This bug is very fond of the red prickly cucumber, commonly known as the "Cape or African Cucumber," and if this is used as a trap, a large number of the bugs can be caught and destroyed.

When fruit fly is troublesome, trapping with Harvey's (B) fruit fly lure as soon as the first sign of the fly's presence is seen and systematically attending to the

PLATE 38.—PASSION FRUIT, REDLAND BAY, SHOWING METHOD OF CULTURE AND PART OF A VINE IN FRUIT.

traps will result in the destruction of large numbers of female flies, and thus reduce the loss they would cause were they allowed to lay their eggs in the immature fruit whilst the skin is still soft and before it becomes so hard that the fly cannot pierce it. As showing the attractiveness of the (B) lure the writer has recently caught no less than 1,200 Queensland Fruit Flies (*C. tryoni*) in one glass trap in five weeks, of which nearly 80 per cent. were females, many being full of matured eggs ready to be deposited; so that systematic trapping with an effectual lure will undoubtedly tend to reduce the loss caused by this very destructive insect.

Passiflora quadrangularis—Granadilla.

The Granadilla is a tropical fruit that is better suited to the northern than to the southern part of this State, though excellent examples of the larger type of granadilla—"*Macrocarpa*"—can be produced in the coastal districts both to the south and north of Brisbane, provided the situation is a warm one, free from frost and well protected. The *macrocarpa*, as its name signifies, is a very large type of granadilla, the fruit frequently weighing several pounds. The seed cavity is small for the size of the fruit, and is surrounded by a thick layer of whitish flesh which has no distinctive flavour, but which, when flavoured with lemon or other suitable flavouring, is used for pies. It is not as a rule a heavy bearer, and must be grown on a horizontal (not lateral) trellis.

The Northern Granadilla—*quadrangularis*—is a smaller fruit of a somewhat irregular, oblong shape, about 4 to 4½ inches in diameter. The pulp cavity is large and is filled with large seeds surrounded with a pale yellow pulp of exceptionally high flavour when the fruit is fully ripe, which is known by the outer fleshy covering becoming soft, and the skin, instead of being a pale green, turns a dull yellowish-green colour. This variety when fully ripe is one of the highest flavoured tropical fruits, and eaten either alone or used in combination with the papaw, pineapple, banana, and the juice of a lemon or lime to form a fruit salad, it is very hard to beat. Unfortunately, it does not carry well and consequently can only be obtained in perfect condition where grown. The granadilla requires a deep, well-drained, rich loamy soil to be grown to perfection, and it does best when trained on an overhead trellis (as shown in illustration herewith, which was taken some years since at Kuranda, near Cairns, and gives a good idea of its habit of growth). Similar manuring to that recommended in the case of the common passion fruit will be found beneficial.

Passiflora laurifolia, "Bell Apple."

The Bell Apple is not grown to any extent in this State as its fruit is not equal to that of the previously mentioned varieties. It is a handsome and vigorous climber, and is more valuable for covering unsightly edifices or for ornamental purposes than for fruit production, and its cultivation for the latter purpose is not recommended.

Passiflora ligularis, Mexican Passion Fruit.

This variety is very highly spoken of by Mr. Wilson Popenoe, the Agricultural Explorer of the Bureau of Plant Industry, Department of Agriculture, Washington, U.S.A., and I am in hopes that we will be able to establish it in this State, but so far we have not succeeded in doing so. I merely mention this fruit as it is the true Mexican passion fruit, and is quite distinct from the large purple or giant passion fruit which sometimes goes under this name. It requires a climate similar to that suitable for growing the granadilla.

Tacsonia mollissima, the Banana-shaped Passion Fruit.

Although this fruit has been seen in fruit shops of the Southern States for some years, it is only recently that it has been met with in our local markets. During last spring a quantity of fruit was offered for sale locally, and met with a good demand at a very satisfactory price. It is not, however, advisable at the present time to plant this variety extensively, despite the attractive appearance of the fruit, as a taste for it will have to be acquired and a demand created before there will be a market for any large quantity of the fruit. Its culture is similar to that of other passion fruits and it is more hardy than the more tropical varieties.

PLATE 39.—GRANADILLA VINE AT KURANDA, CAIRNS DISTRICT.

STRAWBERRY CULTURE.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

Although the strawberry is commonly considered to be better adapted to the climate of the temperate zones than to that of the semi-tropics, it is, nevertheless, the one berry fruit which can be grown to perfection in this State. Excellent fruit is produced in our Southern coastal districts and even under tropical conditions such as those existing at Townsville, when the plants are grown on alluvial soil and are well irrigated, very good fruit is produced. This shows that the strawberry has a wide range in this State and that it can be grown successfully over the greater portion of our Eastern coastline and the tableland country adjacent thereto, provided there is either an adequate rainfall or, failing that, a supply of water for irrigation.

The commercial cultivation of the strawberry is, however, confined mainly to those districts possessing a regular rainfall, and extends from the Redlands Area in the South to Bundaberg in the North. When grown under suitable conditions in this district, the strawberry has proved itself to be an early and prolific bearer, able to stand a fair amount of hardship, in the shape of dry weather, and to resist the attack of insect and fungus pests to a greater or less extent.

There is a good demand for the fruit, either for immediate consumption in this and the Southern States or for conversion into jam, and, as few crops yield a quicker return, it frequently enables a beginner to make a living whilst more slowly maturing fruit crops are coming into bearing. Many a pioneer fruitgrower has to thank the strawberry for his start, as it enabled him to make a living where he would, in all probability, have failed otherwise, and what applied in the case of our pioneers still holds good with the beginners of to-day.

Our strawberries are of excellent quality and carry well, so that they reach their destination in the Southern States in good order when carefully handled and packed, provided the weather is not excessively warm or the fruit over soft on account of excessive rainfall. The fruit is very suitable for jam, and the product of some of our local factories is not excelled elsewhere in the Commonwealth; further, the demand for strawberry jam exceeds the supply, so much so indeed that, for a considerable period of the year, it is not procurable. There is therefore room for the extension of the industry as the price realised for good strawberry jam in the Commonwealth should enable both producers and manufacturers to obtain a satisfactory return.

Soils for Strawberries.

Given suitable climatic conditions, strawberries will thrive in most soils, but the ideal soil for this fruit is a rich loam of medium texture, well supplied with humus, possessing perfect natural drainage, and capable of retaining moisture during dry spells—and the nearer one can get the soil to this ideal the better the results. Heavy, cold, badly-drained soils are not suitable, but any good loam or sandy loam, whether of scrub or forest origin, can be made to produce good berries if properly treated.

Preparation of the Soil.

There is only one way to prepare soil for strawberry culture, and that is, *thoroughly.* Nothing else will do. In the case of virgin scrub or forest land, which is, as a rule, fairly rich in humus, the land, after it is cleared, should be broken up deeply and brought into a state of as nearly perfect tilth as possible. On virgin soil, except it is of the poorest nature, it is not necessary to apply any manure for the first crop, as there is usually an ample supply of available plant-food and humus present in such soil, but for subsequent crops, or old land, systematic manuring is very important. Old land that is at all deficient in humus should have that deficiency made good, either by the application of a heavy dressing of farmyard or stable manure, such as a load to every 4 perches, or if this cannot be obtained, then by growing a green crop such as cowpeas or other legume which has been well manured with phosphatic and potassic manures and ploughing it in. The green crop so ploughed in should be allowed to rot and, when rotten, the land should be reploughed and worked down fine. If the green crop has received a generous dressing of phosphatic and potassic manure, then there will be no need to apply any further fertilising material to the land, as a complete manuring has been given; but if not, then the soil should be treated as recommended later on.

The surface of the land should be kept as even and level as possible, and, as already stated, it should be worked down fine, so that when the young plants are set out they will take hold of the soil at once and become firmly established.

Planting strawberries on raw land, sour land, or land that has been indifferently prepared, is only courting failure, whereas, when the planting is carried out as advised, there is every chance of success.

Selection of Plants.

Always obtain strong runners from healthy, prolific plants. The first runners next to the parent plants are to be preferred, as they are usually the most vigorous and best rooted, and, further, they come into bearing earlier; but, failing these, any well-rooted, strong, well-grown runners can be used, and although they will not fruit as soon as the first runners they will give a good yield later on, and frequently continue to bear when the earlier fruiting plants have ceased.

Planting.

Having secured suitable plants, trim the straggling roots with a sharp knife; take care not to let them dry out, and plant as shown in the illustrations herewith,

No. 1.

No. 2.

No. 3.

No. 4.

which are self-explanatory. Careless planting is responsible for many failures, especially too deep planting, as no strawberry will thrive if its crown is buried under the soil.

The distance at which to set out the plants varies somewhat in different districts, but it is not advisable in any case to overcrowd the plants, but to allow plenty of room. Personally, I favour planting strong plants at from 20 in. to 2 ft. apart each way, so that when planted the land can be worked all round the plant; or if row planting is desired, then the rows should be about 30 in. apart and the plants set out at from 15 to 18 in. apart in the row. The illustration of a strawberry garden at Mooloolah, taken some years since, shows the manner of planting adopted by one of the most successful growers of his day, and it will be noted that the plants have plenty of room and are in no way overcrowded.

Cultivation.

Strawberry plants must only be surface-worked whilst growing or bearing fruit. The object is to keep down weed growth and to prevent the surface of the soil caking; but the cultivation must never be so deep that it will injure the roots. The best implement to use is the Planet Junior hand cultivator or similar machine; or, failing that, a good Dutch hoe of any type that may be preferred.

Weed growth must be kept down and the surface of the soil must not be allowed to become hard and set, as if it does the evaporation of moisture from the soil will be greatly increased, and it will dry out rapidly.

If the plants are to be kept over for a second or third year, then the whole of the runners, other than those required to make good any losses in the original plants, must be removed, and the ground between the original plants must be well broken up and manured in late summer or early autumn, so that the plants will be in good nick for producing a crop of fruit the following season.

If the plants have been badly attacked by leaf blight it is a good plan to cut off all the leave and burn them prior to working and manuring the land, as numerous fungus spores are destroyed thereby. The burning off is best done by scattering a little loose dry straw over the plants when the leaves have been cut off and have dried, and then setting fire to the lot. A light burning does not injure the plants, but is decidedly beneficial.

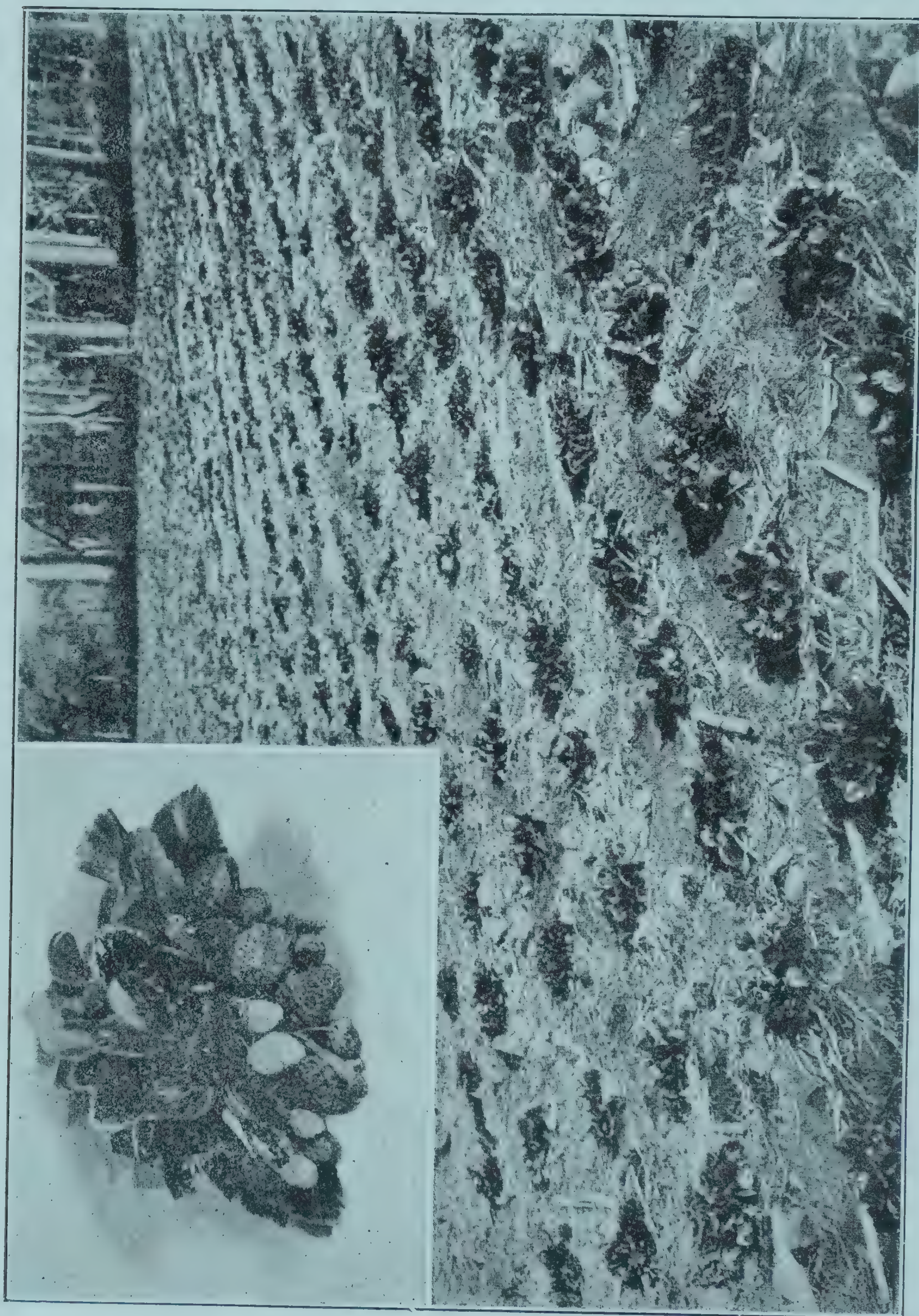


PLATE 40.—A STRAWBERRY GARDEN AT MOOLOOLAH.

Mulching.

Mulching is seldom practised in this State, probably owing to the fact that a really good material for mulching is not readily obtainable, and therefore a light soil mulch produced by the surface working of the soil by means of a Dutch hoe, Planet Junior, or similar hand cultivator is all that is necessary. The use of a paper mulch has, however, much to recommend it, as it would certainly keep down weed growth and tend to maintain even soil conditions. A strip of paper mulch 18 inches wide would be all that is necessary, and the plants should be set through the paper at from 15 to 18 inches apart in the row. A further advantage to be derived by the use of paper mulch is that the fruit would be kept much cleaner as it would not be so liable to be covered with dirt as frequently happens if heavy rain falls or the watering is not very carefully applied.

Irrigation.

Where water is obtainable it should always be available for the plants' use during dry weather, as the ability to maintain an adequate supply of moisture in the soil at all times and thus maintain an even growth will result in larger and better fruit, and a heavy increase in yield. Strawberries pay well for intensive culture, and the money expended in providing a good system of overhead or other method of spray irrigation will be found to be a very profitable investment. A combination of paper mulching and spray irrigation will enable a grower to maintain a regular supply throughout the season of first class table fruit for which there is always a ready market.

Manuring.

The strawberry is a fruit that requires an abundance of readily available plant-food, and one that pays well for systematic and judicious manuring. In the 1924 edition of his pamphlet, "Complete Fertilisers for Farm and Orchard," the Agricultural Chemist to this Department gives the following advice, which it will pay to follow:—

"Some of our coastal country, between the 26th and 28th degrees south latitude, is particularly suitable for strawberry culture, frequently producing quite phenomenal crops. Some of our rich loamy soils found in our coastal scrub lands give the best results. In poorer sandy soils the improvement effected by artificial fertilisers, particularly such containing potash, is very marked, and a light dressing of 5 to 10 tons of stable manure per acre is very beneficial.

"A complete fertiliser for strawberries of the formula 4-8-10 should be used at the rate of 5 to 9 cwt. per acre.

"The following fertiliser mixture may be found useful:—

1 to 1½ cwt. sulphate of ammonia, or nitrate of soda
3 to 5 cwt. basic or ordinary superphosphate
1½ to 2 cwt. sulphate of potash
} per acre;

or,

1½ to 2 cwt. nitrate of soda
1 cwt. fine bonemeal
4 cwt. superphosphate or Nauru phosphate
2 cwt. sulphate of potash
} per acre;

the latter applied by two or three top-dressings, at the rate of 1 cwt. per acre, when fruit is first forming, and thereafter at intervals of two weeks."

Green Crop Manuring.

When dealing with the preparation of the soil, the importance of providing an adequate supply of humus was referred to, and the statement made that where a sufficient quantity of farmyard manure was not available to supply this essential ingredient to the soil, green crop manuring should be used to make good the deficiency. Humus plays a very important part in the composition of soils, and especially so in those devoted to strawberry culture, as its presence in the soil enables it to retain a much larger percentage of moisture than it would do were it deficient in humus. The power to retain moisture is of the greatest importance in a soil devoted to strawberry culture, as the strawberry is a shallow-rooted plant that soon suffers when there is any lack of moisture.

Moisture in the soil also enables the artificial fertilisers applied to become available, as they are of no use whatever to the crop unless their plant-food is capable of being dissolved by the soil moisture, and can thus be obtained therefrom by the roots of plants. When leguminous crops are grown as a green manure they should be manured with a fertiliser containing lime, citrate-soluble phosphoric acid, and potash; such as a mixture of finely-ground island phosphate and a potash salt, used in the proportion of four of the former to one of the latter. No nitrogen need be applied, as the plants will obtain their own from the atmosphere; and when they are ploughed into the soil it will not only be enriched by the plant foods contained in the fertiliser applied to the soil to produce the green crop, but also by the nitrogen that has been produced by the green crop itself; the whole forming a complete fertiliser, as it contains all the essential plant-foods in an available form. Green crop manuring is the cheapest way in which to apply nitrogen to the soil, so that, taking into consideration its value as a supplier of humus, it is of the greatest value when intensive cultivation is intended; and as the strawberry is a crop that demands intensive cultivation, its importance cannot be over-estimated, especially in soils that are deficient in humus. Cowpeas, vetch beans, small Mauritius beans, and the large black Mauritius beans are the best legumes for summer growth and vetches or tares and the grey or partridge field pea for winter.

Marketing.

Fruit for immediate consumption should be gathered whilst still quite firm. It should be carefully handled, graded for size and colour, and packed in boxes or trays containing a single layer of fruit. The use of punnets is not so satisfactory, as the fruit is more likely to be bruised, and it is doubtful if the methods of marketing the fruit in single layers can well be improved upon. Fruit for factory use is stemmed, placed in casks or other suitable receptacles, and forwarded as quickly as possible to the factory. Care in handling, picking, grading, or packing, always pays.

Diseases.

The most serious diseases of the strawberry in this State are those of fungus origin—viz., leaf blight and mildew.

The former can be controlled by the use of Bordeaux or Burgundy mixture applied as a spray, combined with the burning off of affected leaves, as previously mentioned; and the latter can be kept in check by means of sulphur applied in a similar manner to that employed for the treatment of oidium in grapes, or by spraying with sodium or potassium sulphide or a weak solution of lime sulphur. Insect pests seldom do any very serious injury, but when leaf-eating beetles or other leaf-eating insects are present they can easily be destroyed by spraying with arsenate of lead; or in the case of cut-worms these insects can be kept in check by the use of poisoned baits.

Varieties.

Although most of the standard varieties of strawberries have been grown in Queensland at one time or another, experience has shown that no one variety has proved permanent, but that it has been necessary to either raise new kinds from seed or to introduce them from elsewhere. Varieties producing perfect flowers have proved more profitable than pistillate sorts and are therefore most commonly met with.

After being grown in this State for a few years most varieties become weaker in growth, more liable to disease, and less prolific, so that they have to be discarded. The introduction of new sorts is thus essential, and there is no better way of doing this than by raising local seedlings. Some of the best sorts ever grown in the State have been locally raised seedlings, of which the *Aurie, Anetta,* and *Phenomenal* are good examples, and there is no reason why sorts equal or even superior to these should not be produced. The raising of seedling strawberries is now being carried out at the Nursery, Bribie Island. A large number of young plants grown both from local and imported seed are being tested, and there is good reason to believe that amongst them we will get one or more varieties that will prove to be suitable to our climate and that will be prolific bearers of commercially valuable fruit. Of the well-known standard varieties, such as *Marguerite, Trollop's Victoria, British Queen, Pink's Prolific, Federation, Melba,* and *Edith,* and several others that have been grown from time to time in this State, few are now planted. *Phenomenal* (a Gympie raised seedling) is now the variety most commonly met with; other new varieties are being tested and some of them may prove to be adapted to our local conditions. The type of strawberry best suited to this State is a vigorous healthy grower—that is, a good bearer and producer of good coloured fruit of good, firm texture and fine flavour; a fruit that keeps and carries well, and that meets the requirements of both the fresh fruit trade and of the jam maker.

SOME NOTES ON WESTERN QUEENSLAND FRUIT INSECTS.

By A. A. GIRAULT, B.Sc., Assistant Entomologist.

In order to obtain some definite information regarding the general character of the insect pests of fruits in a Western Queensland locality, as compared with the coast, a visit was paid to several orchards near Roma, with the object of obtaining specimens and making observations.

The large orchard at Red Hill, 5 miles from Roma, now owned by Mr. A. H. Hickson, and that at the State Farm at Bungeworgorai were the two main places at which collections and observations were made; but, in addition, several small plantings near the former were inspected as were also some vineyards.

As a whole, the orchards were clean; the vineyards were remarkably so, and bore very heavy crops of clean fruit. For the purpose in view, it was not considered necessary to extend the scope of the work. The time occupied was 2nd and 3rd December, 1925.

The orchard at Red Hill, being irrigated, was in better health and the trees were of greater stature than on the State farm, where the trees showed the results of a dearth of water; and I was informed by Mr. Soutter that, in the absence of irrigation, citrus trees did not do well on the latter place on account of the scanty rainfall.

Citrus Insects.

With the exception of the grape, citrus varieties were the principal fruits in the localities visited and as the grapes were free of pests, practically the whole of the collections and observations were made from citrus trees. The fact that no fruit flies were seen nor did any person report them is worthy of mention.

The destructive insects observed were as follows and attention is directed to the fact that all the species dealt with occur in the coastal fruit districts.

1. *Aspidiotus aurantii.* The Red Scale.—This was the most serious citrus pest found in the district, but at Red Hill it was held in control, although nearly every tree was infested. At the State farm, this serious pest was less in evidence on citrus, but it occurred occasionally upon other fruits and upon every part of the orange except the roots.

2. *Aspidiotus perniciosus* Comstock.—The presence of this highly destructive species was suspected in several instances, but its actual occurrence could not be demonstrated. Discolorations were the main symptoms present, but the insect causing these had perished and disappeared.

3. *Biprorulus bibax* Breddin. The Spiny Orange Bug.—This is, perhaps, the second most serious pest of citrus occurring in the orchards visited. It was more abundant at Red Hill than on the State farm, but is at present doing little damage. All stages of the insect were found and eggs were being laid at the time of my visit. In the warm parts of the day the adults fly, making a loud buzzing noise in doing so. On the trees they were usually seen in twos and threes, sucking a fruit (ripe grape fruit or small green oranges) or a blossom. When disturbed they eject a malodorous liquid, from glands upon the ventral thorax. The egg masses observed were always upon the upper surface of the leaf and when first deposited the eggs are whitish. From one discoloured egg mass, parasites were seen to have emerged from large jagged holes through the operculum. Upon dissecting a few of the eggs in this mass, the dead remains of a Proctotrypid (probably a *Telenomus*) and of a Chalcidid (probably a male *Eupelmus*) were disclosed. Later, four distinct parasites were obtained from these eggs.

The recently hatched young, after coloration is established, are glossy black, the abdomen salmon pink bordered narrowly first with white, then a broken black edge, the disc bearing a large spherical black spot which is transversely divided into four parts by narrow lines of white (of the areas thus marked off the second and third are thickest). In later stages, the whole body is dull green, the discal spot of the abdomen disappears and the margin of the abdomen bears only a black spot at the caudal end of each segment (as in the adult). The "horn" is not developed until the adult stage. The thorax above is finely pin-punctate in both larva and adult.

After hatching, the young of this species have the habit of squatting over the egg mass for several days.

In regard to the latter, observation revealed that the number of eggs per mass varied as follows in six egg masses counted:—12, 11, 11, 12, 12, 13, the latter being in a single line along and upon the midrib; usually, however, the eggs in the mass form an elongate figure of twos or threes or these in alternation. They are similar to those of the Bronzy Orange Bug (*Oncoscelis sulciventris*), but are decidedly smaller and instead of being globular are of greater height than width; the surface sculpture is not quite so dense, and in *Oncoscelis* it appears to be formed by minute papillae instead of by minute punctuation.

Of the fourteen adults captured and examined nine were males; this sex is somewhat smaller than the other and differs externally from the female in that the external genitalia are formed of one piece whereas in the female they are divided into a number of sclerites.

4. The Orange Butterflies.—Two species were observed in flight through the orchards at Red Hill—*Papilio aegeus* and *P. anactus.* A pair of the latter were captured, but upon the main orchards no other stages were observed. However, upon young trees elsewhere the eggs, always deposited upon the tip of a young leaf of the new growth, were commonly observed, as were also the solitary caterpillars in several stages of growth. Specimens were obtained and preserved.

The injury done by the larvæ of these butterflies is usually confined to the new growth of young trees, and Mr. Hickson informed me that this damage is occasionally sufficient to stunt growth. Spraying with arsenicals is an easily applied remedy.

5. Locusts.—A pair of large grasshoppers were captured from the foliage and were observed to be common in the citrus orchard. The species proved to be *Acridium irregulare,* and is of great size and power. I was shown fruit which bore large whitish scars said to have been caused by the bites of this insect. The young of a katydid was also taken from the foliage.

6. Borer—*Uracanthus cryptophagus* Olliff.—An adult of this species was given to me by Mr. Hickson. Later, the burrow of a larva, full grown or nearly so, was located and secured. The larva had travelled more or less spirally about 3 feet of the branch, the latter an inch in diameter. This and other borers were scarce.

7. Plant Bug—*Amorbus robustus* (?).—A single adult of this species was captured and I was informed that it sucked the tender growth. The specimen was placed among the accessions in the insect collection (Het. No. 2174). Its identity is more or less uncertain.

8. The Orange Siphanta.—An occasional specimen and egg-mass were observed.

9. *Lecanium hemisphaericum* Targioni.—Occasionally observed upon orange twigs. The larvae were hatching.

10. *Siphonophora citrifolii* Ashmead.—Noticed upon new growth at Bungeworgorai.

Other Fruit Pests.

Upon grape I found nothing but lady-birds and upon other fruits no more than the Red Scale and a Chrysomelid beetle (Coleop No. 8525) feeding upon the tender foliage of plum and apricot. The larvae were not present.

An Olive Insect Heretofore Little Known in Queensland.

Upon cultivated olives my attention was drawn by Mr. Soutter, of the State farm, to what he thought was a thrips occurring upon the under side of the foliage and disfiguring it with oily spots of what appeared to be excrementitious matter. These insects were abundant in patches, but aside from the disfigurement did not seem to be doing much injury. However, they discoloured the foliage also. The adult and several larval stages were present, but no eggs were found.

The species turned out to be a Tingitid, *Froggattia olivinia,* described by Horvath from specimens sent to him by W. W. Froggatt, who found it in several localities in New South Wales.

The larvae are flat forms with the margins of the body covered with semi-erect spines, these regularly disposed around the abdomen; two or three of the spines project forward from the front end of the head. The disc of the body is usually sordid, the antennae being white with a black club.

In 1916 Tryon recorded this species from a native shrub in Queensland, one not related to olive, this being the first record of its occurrence within the State.

EAR ROT OF MAIZE.*

(*Diplodia Zeæ* (Schwein.) Lév.)

By HENRY TRYON, Vegetable Pathologist.

FOREWORD.

This Memoir—"Ear Rot of Maize—*Diplodia Zea* (Schwein.) Lév."—by Henry Tryon, Vegetable Pathologist, based primarily on two cobs of Maize referred to him for examination and report, indicates that what hitherto in Queensland has been regarded by the farmer as a form of deterioration of the mature maize-grain, signified in the general terms "Mouldy Corn" or "Mildewed Corn" applied to it, is really a parasitic disease proper to the growing plant, one that, whilst under ordinary cultural treatment in maize-growing in any district wherein it occurs may be both augmented and perpetuated with more or less prejudicial results on yield. The disease may, on the other hand, under modified procedure that its presence involves, be largely checked and considerably reduced. It is therefore published for general information as having an interest far beyond the immediate purpose that occasioned it.

E. GRAHAM, Under Secretary.

26th November, 1925.

INTRODUCTORY.

On 11th August, 1925, two maize cobs were received, accompanied by a letter from "The Atherton Tableland Maize Board" to L. R. Macgregor, Council of Agriculture, dated Atherton, 25th July, 1925, and signed R. Day, secretary, in which they are thus referred to:—

"Two cobs of corn which are totally comprised of white dead grain. There is a great quantity of maize of this nature, included in crops on the Tableland, and at present it is being discarded by growers as of no value; or, if any is included in their crops, when delivering to the silos, it is marked against them in grading."

Further the secretary invited the prosecution of inquiries—"with a view to informing us if possible of, firstly, the cause of the dead grain; secondly, any suggestive remedy to prevent same; and, thirdly, as to whether maize of this nature has any feeding value," since the results of such "would be of much interest to growers here."

These cobs of corn when delivered to me, without cover, were found to be much "rubbed and broken and not in a fit condition for examination."

Accordingly, I at once approached Mr. F. B. Coleman, Inspector, Stock Foods Act, who was visiting the Atherton district, suggesting he take the necessary steps for "obtaining specimens direct from the grower" and "bring them with him to Brisbane in returning."

The officer in question, as the outcome of this, obligingly furnished me, on 15th September, with a series of carefully selected corn-cobs illustrative of the injured condition referred to, together with carefully collated information bearing on the circumstances under which the

*Published also in pamphlet form.

specimens exhibiting it were met with, and facts relating to the occurrence generally—derived from his own observations, and the testimonies of representative maize-growers who had had personal experience of its incidence. Data bearing on the rainfall of district in question were also furnished.

OCCURRENCE.

Mr. Coleman's statement, that had reference to the Kairi, Tolga, and Atherton districts of the Atherton Tableland, was to the effect that "this blight or mould occurred practically in every field, irrespective, apparently, of the various methods of cultivation employed, and of the different kinds of soil" in which the crop was grown; also that "it seriously affects in quality of maize" throughout the area. Also that in fields from which the samples furnished were derived "the percentage of (ears in) crops damaged ranged from 12 to 45 per cent. by count"

The testimony elicited from individual growers, summarised, was that the maize trouble was not a new occurrence, that it was worse when the field was subject to wet weather following on "dry spell," and the old lands—the areas longest devoted to maize-growing—were those worse affected.

SELECTION OF SAMPLES.

The officer mentioned thus described his procedure in examining the corn-cobs for evidence of this maize affection, when securing the specimens submitted:—The husks, covering the cobs, were separated at the tips of the ears, so as to expose the grain and silk, and if, in doing so, these presented characteristic outward symptoms of the "disease" they were replaced and confined in position by use of string, and the individual cob reserved.

GENERAL APPEARANCES.

(*Note.*—The samples were all derived from maize of which the stalks had long since died in the ordinary course of growth, the cobs having been left on the plants exposed to the weather, for the purpose of field-drying-out, for longer than would be necessary in the southern cornfields of the State, where other meteorological conditions obtain than those characterising the Atherton Plateau, and thus the husks presented outwardly an unusually dark appearance due to the ordinary moulds (Cladosporium sp., &c.) that live on dead plant tissue.)

Possibly the first feature that will present itself will be the exceedingly light weight, relatively speaking, that characterises the affected ears. On removing the husk piece by piece, and on rejecting the outermost ones, especially those springing lowest from the "shank" and exhibiting the effects of prolonged weather exposure (*vid.* Note), it will be noticed that they are unusually pale-coloured, and, especially when the trouble is pronounced, of a thin and somewhat delicate texture. Also that their surfaces are more or less covered with a very thin "skin" or film of white mildewed-like substance, that may be in patches or occupy them entirely, with the result that they have become very closely coherent, the fungus film occupying continuously apposite faces, and in fact may be quite difficult to separate without their being torn; these features being more and more pronounced as in this process of detachment the grain is being reached. (Plate 41, fig 2.) Then it may be found that the delicate innermost bracts have been impressed or indented with the crowns of the grains, lacking the ordinary turgour to

prevent this happening. What too remains of the "silk" is now also discoloured, mildewy, and more or less adherent to the grain.

The grain may occur as usual in uninterrupted rows, but manifest a somewhat shrunken appearance, apart from the crown-depression usual in Dent corn. It has, however, now entirely lost its polish and lustre, and is not only dull-hued but bleached, its ordinary deep amber colour giving place to a pale creamy yellow. Again, it may be more or less clouded or blotched at the sides with brown. Moreover, it appears to have been dusted over outwardly with very fine, white meal; and, in the narrow sutures between grain and grain, this substance is packed so as to outline the individual grains with what is really the exposed edge of a film or crust of mildew, that separates more or less continuously one from another. The grain again is very readily detachable, its stem being apparently decayed; and the cob to which it is attached has a whitish colour and is much more fragile than in ordinarily sound maize-ears. In fact, generally speaking, the cob is white mildewy right through, without presenting the common features of rottenness. (Plate 41, fig. 1.)

This dry condition of apparent decay is again further suggested when one cuts through an affected grain. (Plate 42, fig. 3.) This is not only white like flour within, the "germ" alone excepted—a remark that applies to both the starchy and horny (yellow) endosperm—but has become so altered in its consistency that it is now even more yielding to the knife than would be ordinary chalk. Moreover, like chalk again, it is readily broken up and reduced to powder on receiving the slightest impact; only the pericarp or hull, that remains apparently unaltered although weakened, securing its intactness. In fact, when such grain finds its way into the silo, much of it must either be reduced to fragments or even to powder, that, like so much flour, will subside to the bottom of this container; the fact that this profoundly altered grain is now, too, unusually dry contributing to this event. In short, a condition is realised that has won for the alteration brought about the term "Dry Rot," although it is not such as one ordinarily associates with this term, denotive of decay.

From a consideration of the features presented generally by affected corn-cobs, it is evident that the destructive changes alluded to have not proceeded from the husk inwards, but *vice versâ*. Also that the cob proper is not the first part to be affected, but on the other hand the grain. Again it is usual, when this is so, that every grain has participated in the alteration described. Further, that the shank, and in turn the stem, perhaps, may become successively involved in injury, after the cob; as may be seen on cutting longitudinally downwards through them, from the point of union of the former with the affected cob, and noting the progressive brown discolouration one or both have undergone.

THE CAUSE.

This is undoubtedly a parasitic fungus possessing all the characters of the one named *Diplodia Zeæ* (Schwein.) Lév. The following facts are connected with it and its occurrence:—

(1) VEGETATIVE GROWTH—OCCURRENCE AND DESCRIPTION.

The most obvious feature of this parasite is its vegetative form or mycelial growth (mycelium), that develops both externally and internally in close association with its host-plant, the maize. The fine, white,

felt-like film occurring on apposite faces of the glumes constituting the husk, as well as the denser patches of the same material that intervene between grain and grain on the cob, illustrates this growth, and are really in each case an intricately interwoven mass of slender septate threads or fungus hyphæ. (Plate 44, fig. 2.) These, the mycelial threads, also penetrate through and through the tissues of the husk, whereon outwardly, as the result of this, they occur so conspicuously; so also with respect to the grain itself. And, again, they traverse thoroughly in all directions the cob to which this is attached, and then in turn pass through the tissue from the cob to the shank.

With respect to the grain, the circumstances characterising the presence of these mycelial threads within it are noteworthy. When this is suitably prepared, so as to admit of thin sections being made, and on doing this, and the starch being removed, it will be found that all the tissues possess the very finest of colourless fungus—hyphæ—traversing their component cells; also that the walls of those cells composing the starch-tissue—always thin—have almost disappeared, and that the starch-grains themselves, that should be of even circular outline, although often somewhat angular by compression, are now very irregularly shaped, having their surfaces evidently considerably eroded or dissolved away. (Plate 42, fig. 5.) These internal grain-tissues have in fact evidently undergone a process of degradation, as the growth of the parasitic fungus has proceeded within them; such as might be effected by the action of diastase, an amylolytic enzyme; that, as has been elsewhere shown, this parasitic fungus produces, during its vegetative growth, at the expense of the plant organism that sustains it. (*Note.*—The actual loss of substance brought about by this agency may be concluded from the fact that, as I am informed by Mr. Coleman, on comparing the weights of a large number of affected grains and sound grains, the two being otherwise as far as possible identical, a reduction of 22 per cent. was found.)

The fungus mycelium, that is quite colourless—although white when viewed *en masse*—is not always composed of "hyphal threads" of even calibre, as there are often curious thickenings in its course, as especially happens when it is traversing the tissues composing the central cob. That within the grain, however, is of special tenuity. (Plate 44, fig. 4.)

The parasite again vigorously attacks the germs so that a fungus-affected grain rarely sprouts, if at all, and then generally the plantlet is too weak to survive.

(2) THE REPRODUCTIVE GROWTH—OCCURRENCE AND DESCRIPTION.

The reproductive phase of the parasite's organisation is shown in the occurrence of minute black, point-like bodies. These we have found (1) on the inner surfaces of the husks embodied in the white mycelium, and occurring here singly or in little groups; (2) on the shanks to which the ears are attached and on the portions of the stems from which these have sprung, and in these cases they have been met with emerging through the hard epidermis from within; (3) on the affected grain itself, on this having been kept in a moist chamber, their appearance following (commonly) that of a Penicillium (evidently an accidental occurrence) emerging through the white mycelium that meanwhile had produced a flocculent development of growth entirely covering it. In the latter case, occurring often in large numbers on each single maize-grain. (Plate 43.)

(*Note.*—These occurrences were afforded by the samples of ears of corn available for examination, and must not be regarded as embracing all the circumstances under which the small black bodies might have been met with in the course of field observations. Soaking in water the dry maize tissues of affected parts, as a preliminary course, again will cause them to appear under sustained damp conditions more commonly.)

Omitting technical details, these small black bodies—that microscopical examination indicates spring from the mycelial threads and within the subjacent tissue in each case—are, it may be said, little pear-shaped sub-spherical or ellipsoidal bodies named "pycnidia," whose thick walls of cellular tissue contain a cavity enclosing fungus spores or seeds. Generally they are simple and arise isolatedly, but two or more may be merged together in a common connecting also dark-coloured substance—a stroma. But still they are mere points or specks only in size, although their structure suggests, as is actually the case, that they are well adapted to maintain the vitality of the spores they contain. Plate 44, figs. 5, 6, and 7.)

They are eventually broadly flask-shaped, being now each endowed with a single broad conical protuberance (osticlum) that, as the spores within them mature, is thrust outwards through the epidermis within which it is at first developed, and, if present, through the white fungus mycelium encrusting it.

Within the interiors of these conceptacles are formed the characteristic relatively large spores of the parasite, that are elongated and cylindrical with rounded and elliptical ends. They are straight or slightly curved, and with a septum dividing them into two nearly equal lengths (bilocular). In colour they are very dark smoke-brown (fuliginous), and in length are from 20 μ to 30 μ having a width of 5 μ to 6 μ (μ = ·001 mm.). These spores are sprung each from a short stalk that in their early lives, being not divided off, is not easy to discern. Again, these fungus-seeds, as they develop within the pycnidia, seem to radiate from a central point, rosette fashion. (Plate 44, figs. 1, 6A, and 8.)

HISTORICAL.

The fungus is evidently, as above stated, one originally named by Schweinitz in 1822, *Sphæria Zeæ*, its features detailed corresponding with his description of it. However, it has, during the hundred years that have elapsed since this event, received several other generic names—amongst them Dothiorella, for instance. It is now termed technically *Diplodia Zeæ*, the former word alluding to its 2-celled spores, and the latter to its host the maize—*Zea Mays*.

Notwithstanding this early recognition in 1822, it was not until 1908 that it was definitely recognised as being a parasite of the maize plant, by the American writer J. T. Barrett. He too, in association with T. J. Burrill, published in 1909 a full account of it, and its life-history, including a description of its parasitic habit, in his "Ear Rots of Corn." Prior to this period, in fact, it was included as one of the micro-fungi that occur exclusively in various parts of the dead and decaying corn-plant only.

Further, until 1922, it was considered to develop as a parasite, only on and within the ears and the stems or shanks to which they

are attached, and on no other parts of the growing or living plants; but during this year L. W. Durrell, of Iowa, U.S.A., reports, as the outcome of his observations in that State, that infection may spontaneously occur on the roots and stems also; the most common parts of attack under the circumstances being the stem-joints or nodes where one would expect to find lodged spores. Only so, however, under conditions of extreme moisture and high temperatures. All infection in any case is only a topical one, no general systemic pathological changes ensuing.

The Australian occurrence of this disease appears to have been first made known—but in a very general way—by Dr. Darnell Smith, when dealing with the "Fungus Diseases of the Maize" in March 1918. Then he describes it as a New South Wales maize malady under the terms—"Ear Rot of Maize" *Diplodia Zeæ* (Schw.) Lév.; "Maize Culture," Farmers' Bulletin 116, N.S.W. Dep. Agr., Mar. 1918; "Fungus Disease of Maize," *op. cit.* p. 33-37). He, however, omits reference to locality of occurrence, but states that the "disease is a serious one and appears to be spreading" (p. 33). Shortly subsequent to this (1919) the present writer recorded its existence in Queensland also, under the name "Cob Rot," caused by *Dothiorella Zeæ* (Report of the Entomologist and Vegetable Pathologist for 1918-19, separate, p. 9, Brisbane, 1919).

This related to its presence in a small area of maize in the Eudlo district, where it was occasioning noteworthy damage already in June 1919; whilst a further instance of its presence in Southern Queensland was afforded by an incident near Samford reported on 20th July of the same year.

(*Note.*—The former of these instances of occurrence of the disease in question in Queensland is thus alluded to by the writer in the report cited, and may be of historical interest) :—

> "*Maize.*—(1.) 'Cob Rot,' caused by *Dothiorella Zeæ* (a synonym of *Diplodia Zeæ* (Schwein.) Lév.) or a related organism. As its name implies, it firstly affects the cob of the maize plant; the ensheathing bracts have an appearance suggestive of mildew, and the grains being dull and brownish-coloured in patches of greater or less extent with an intervening felted, often pinkish coloured, mass of fungus mycelium. The individual grains are darker-hued on their opposing faces on the cob, and on sections reveal an abundance of mycelial threads intervening between the epidermis and aleurone layers which here and there form stromata that ultimately rupture the cuticle forming at the same time isolated cavities in their midst that become filled with spores.
>
> "In one instance of the occurrence (Eudlo district, South Queensland) of this disease brought under notice, 15 per cent. of a small area of maize had become affected by the presence of this form of Cob Rot, but it had been subject to heavy rains. In another,inquiry was instituted as to whether such maize would be injurious to stock if incorporated in their ration. With the knowledge of what serious ill-health has been attributed to the consumption of mouldy corn (although we have not here a case of mouldy corn as ordinarily understood), the farmer is ill-advised who ventures to feed his stock with any maize that contains so-called 'dead grains,' such as we have here."—*Tryon, H., l.c.*

THE PARASITE IN LIFE.

Should the portion of disease-affected maize plant (husks, grain, cob, shank, stem, &c.) on which the spore-cases (pycnidia) with their contents have formed be maintained in a dry atmosphere, or in one in which the humidity falls well short of its saturation point, they will persist without alteration for considerable periods—many months, in fact.

This influence of dryness in effecting a condition of dormancy and acting on the parasite directly, or through the medium of the tissues of the plant—those of husks, cobs, grain, stem, &c.—extends to the mycelial threads, although their destruction may at times be earlier brought about by its not only affecting their growth but also their development of pycnidia; so, too, the growth also and liberation of spores by these fruit-organs. And, again, the sprouting or issue of spawn-threads by the spores themselves, whose structure and colour even suggest this possibility of endurance occurring.

The writer's observations have related to the persistent vitality of the mycelium and to its failure to produce pycnidia (a production that, as after events indicated, had evidently been delayed). This he estimates has, in the case of Diplodia-attacked corn, extended this season to about three months, including July, August, September, 1925, at least.

Messrs. Burrill and Barrett proved that spores taken from a culture at the expiration of 51 days germinated; although at the hand of Dr. Van Bijl, when twelve months old and of similar origin, no germination took place (*op. cit.* p. 291). There have, however, apparently been no very definite experiments conducted, bearing on this question regarding the longevity of spores isolated from the pycnidia, in which they may be long retained without detriment to, although without evidence meanwhile of, their vitality.

It has been observed that Diplodia spores from portions of maize plant that had lain exposed for five months, have readily germinated in 48 hours 10-12 per cent., and in 96 hours 15 per cent. (Burrill and Barrett, p. 81), and that others taken from two old, diseased cornstalks that had been kept indoors for six months germinated to the extent of 90 per cent. and 92 per cent. respectively (*Ib., l.c.*).

The influences of soil conditions on vitality must not, too, be lost sight of; but these again do not appear to have been fully inquired into, although Dr. Van Bijl found in two instances, after burying cultures in which the mycelium and pycnidia of *Diplodia Zeæ* occurred, and then removing them at the expiration of a period of twelve months, there was no germination.

Again, since corn, in areas where this disease occurs, must be often consumed in feeding stock, and the resulting droppings may find their way into the field, the question may be raised—Do *Diplodia Zeæ* spores under these circumstances retain their viability? Here we have only experiments on mice to guide us. These were conducted, again, by Dr. Van Bijl. As the result of two experiments in feeding these animals with cultures in which spore-containing pycnidia had been crushed, he found that, although the spores had been retained in their alimentary tracts for 14 hours, they germinated after being passed out with the fæces but that evidently the growth was only weak. So much with regard to this important matter of continued life in the parasite.

Now, when the above-mentioned parts of Diplodia-infested maize containing the spore-cases have been subjected to moist conditions,

especially if already they have or purposely have been soaked with water (rain, &c.), a slender, long, twisted, tendril-like, black body will issue from the emerged summit or ostiolum of each, and this on examination will be found to be composed entirely of the elongated 2-celled spores—already described—agglutinated together, although easily separable, especially in water. In fact, under these circumstances, these peculiar filaments originating in this manner may now be met with quite numerously, where previously there was only a delicate film or encrustation of white fungus mycelium on the surface, or even none at all.

These spores in ordinary water, or preferably in suitable nutrient fluids, will commence within 5 to 8 hours to germinate, the period being delayed even for 2 to 3 days with certain, and in the case of some media with all, of them. A delicate, colourless germ-tube results from germination of each spore, and this as it grows becomes septate and branched; and the several such germ-tubes arising together soon form with their further growth an intricate mycelium.

This marks the extent of our present inquiry; but investigators in the United States (Illinois) and in South Africa have further tested their growth both in these nutrient fluids and on many solid media also, noting especially that when the mycelial threads (vegetative phase of fungus-life) have continued growing for a few days, more or less according to the medium for growth employed, pycnidia and spores are formed in connection with them similar to those that arise when they have been formed in or on the maize-plant tissue. In fact, it was found by J. Burrill and J. T. Barrett that an extract of corn-meal with agar was the best medium, of those employed in the laboratory, for securing this free growth of the fungus organism to its spore-bearing (reproductive) stage.

The Illinois workers above referred to, Messrs. J. Burrill and J. T. Barrett (1909), obtained positive results in this way in no less than nineteen out of twenty tests, in which different substances of immediate plant origin served as media; whilst Dr. Paul A. Van der Bijl, of Natal, to whose graduation thesis—"A Study in Dry Rot Disease of Maize caused by *Diplodia Zeæ* (Schw.) Lév." 1916—the writer is largely beholden for information, tested no less than thirty different cultures with regard to the growth of the Diplodia fungus up to the pycnidia stage, and obtained positive results with all but six. These culture tests were at a temperature of 25 deg. C. (*op. cit.* p. 26-29).

The foregoing facts are of interest, since they go to show that the *Diplodia Zeæ* is not always dependent on the living maize plant for its existence and continuous growth, when once present.

Van der Bijl's memoir also records the results of experiments under test conditions in ascertaining the effects of specific alkalies, acids, and carbohydrates in influencing the growth of the Diplodia.

When the spores of the fungus, on issuing from the pycnidia as described—an event that takes place under special weather conditions, as may be now inferred—in turn drop to the ground, either on having become dry where they originate, or on having been washed down into it and having done so, then, as Burrill and Barrett in the course of their experiments discovered, they may be taken up into the air and transported by the wind ("Ear Rots of Corn, 1909," pp. 81-83). As proving this they used pieces of glass that had been smeared with glycerine, or glycerine and alcohol, fixed to stakes in the ground to detain if perchance any spores that came in contact with them, on their being so exposed near affected stands of corn, or near ground in which

a diseased crop had formerly been grown. These were thus displayed for several days; in one experiment the glasses being exposed even near land in which diseased corn had been raised, but that had been later devoted to the growth as a successive crop of either lucerne or clover, and where, too, pieces of the old corn-stalks still remained on the ground; and in each of eight tests the spores of the Diplodia fungus were captured from the air, from 2 to 400 being obtained on individual pieces of glass.

Similarly, like tests were carried out in order to ascertain if the fungus spores were conveyed over long distances from where they originated. These involved distances of from 50 to 350 yards, but notwithstanding, in all cases, covering the employment of fifteen smeared glass slides, the characteristic Diplodia spores were secured.

The foregoing facts narrated, indicate whence individual maize plants may become infested, and whence the infective agent may emanate too, and reach corn-plants previously free from the disease.

ACT OF INFECTION.

The facts of maize plant infestation, and how it is brought about, has too been ascertained by the three investigators mentioned; also experimentally Messrs. Burrill and Barrett in 1907 made numerous tests with corn that had cobbed, and that was in different stages of growth—just silking out well, or the silk well developed, already commencing to dry. They made wounds with a knife in different plants and then inserted spores in these. They also placed spores under the outer husks, or well down into the silk. Positive results—effective inoculation—were thereby secured; but most of them were to be explained as the action of wound parasitism. However, spraying the ears with a fluid medium in which the spores were suspended, when the grain was in the "hard milk stage," gave the best results: "80 per cent. of silk-inoculated ears produced (thus) the disease"—in fact, thereupon. When the cobs were first silking out well and showed no signs of drying whatever, spraying only gave 3·3 positive infections.

"A number of inoculations made on stalks and leaf-sheaths by merely applying spores to the uninjured surface of each, and in slight wounds made by scratching with a needle, were entirely unsuccessful" (p. 85).

Dr. Van der Bijl, in the course of his Inoculation Experiments (pp. 15-17), using spores in suspension in water, produced infection by puncturing the green ear through the husks; by squirting the fluid into the silks that had reached a stage of growth just fit for pollination; and by watering the silks with it at this period also, placing at the same time a little of the fungus mycelium on the silks; and by pollinating and applying the spore water-suspension, at the same time. Summing up his positive results in these terms:—"The inoculation experiments already referred to (pp. 15-16) clearly show that maize in the field readily becomes infected through wind-borne spores (*vid.* p. 10) which find their way on to the silks of the maize plant, at or about the time of pollination" (p. 17).

The so-far limited observations of the present writer suggest this method of infection also. Thus, when a maize grain or kernel is only slightly infested—a fact perhaps only to be discovered by microscopical examination of its tissues—the Diplodia mycelium has been found to

be restricted in its occurrence to the tissue (testa) intervening between the outer hull (pericarp) and the aleurone layer; in other words, occupying just such a position as might be expected—when one realises the process of development of the ovary—with mycelium entering through the stylar cavity that of the "silk" filament (style), connected with each individual maturing grain.

A recent writer, L. W. Durrell ("Nodal Infection of Corn by *Diplodia Zeæ,*" Iowa, U.S.A. Agr. Station, Research Bull. 77, 1923), considers, as we have previously stated, that the most common points of attack are the nodes or stem-joints and ear-shanks; and that all his observations and experiments emphasize the fact that *D. Zeæ* infects locally the maize plant at any point where blown spores lodge, moisture and temperature being of course essential to this act.

Notwithstanding the ultimate pernicious results from the free growth of *Diplodia Zeæ* in the grain, the writer does not consider it as being a vigorous parasite of the growing plant. Thus (*vid.* succeeding paragraph), with regard to this generally, its attacks are so ineffective that previous to 1923 they had been overlooked; and with respect even to the kernels, their development, in spite of its presence within them, can still proceed almost to the stage of maturity; until in fact, in the case of the Dent corn varieties, therefore, the characteristic depression (dent) in the crowns has arisen.

SOURCE OF INFECTION.

Probably always, as our observations appear to show, the maize grain or kernels when occupied by the fungus to the fullest extent, as commonly happens, yield the seed-bearing conceptacles, or pycnidia, to a relatively larger extent than does any other part of the maize plant; yet it is considered by us that the part they play in infection is not one of an immediate procedure, owing to the fact that they furnish viable spores to both soil and air, and so only indirectly effect it.

The South African observations indeed show that "in the maize inoculated in the field, no instance was found where the disease spread from ear to ear in the same season."

Dr. Van der Bijl, in the 1913-14 Natal mealie season, planted "kernels" from typically infected cobs, but, though many of them failed to germinate, not one of the plants raised had infected ears. This also applied to maize plants raised from clean seed in the same soil in which this experiment had been carried out, during the ensuing season—an indication, he adds, "that the malady is not carried over in the seeds" (*op. cit.* p. 16).

So with regard to apparent inability of soil, &c., harbouring the fungus spores to infect, through seed planted therein, maize plants grown therefrom. Thus Van der Bijl states that, notwithstanding some maize kernels soaked in water containing Diplodia spores grew, the plants afterwards showed no trace of the fungus upon them (*op. cit.* p. 17).

SYMPTOMS AND OCCURRENCE OF ATTACK.

In the field, soon after the fertilisation or pollination has taken place, a premature yellowing of the husks, on plants otherwise healthy, is described as illustrating its diseased condition. Or in other words,

with the Diplodia infection "these husks have a dried appearance," somewhat difficult to define, "whilst healthy ears still retain their normal colour." Again, at the same time, too, a growth of white mildew within the leaves of the husks and on the surface of the cob becomes manifest, "the number of ears thus shown to be infected increasing more or less through the season." This progressive increase must not, however, be necessarily regarded as implying successive infections covering the same period of time, but as reflecting a variation in the dates arrived at by the plants in attaining a definite stage of growth—tasselling, for example. This may be concluded from the circumstances governing these infections, in which more than a single factor operates; and in the common observation, that infection between the ears of one plant and the ears of another occurs only slightly if at all, for the disease is not systemic as regards its plant-host, but almost confined to definite parts of it—the ears; and moreover there appears to be a more or less uniform period in which all the plants in a maize area are first affected by its presence.

MODE OF INJURY.

CHANGES EFFECTED.

This is obviously conditioned by incidents connected with the growth of the Diplodia fungus in its parasitic relations, and probably only to a very small extent by any factor otherwise directly affecting this—e.g., the essential composition of the maize plant itself generally. This growth implies nutriment and its occurrence in a form in which it can be assimilated; and, if not immediately forthcoming in the parts of the plant in which the parasite is growing, then its preparation from bodies therein from which it can be made.

It might be suggested, in accordance with what takes place with other plant parasites, that final injury might also be brought about by some toxic principle, formed in the tissues invaded, excreted by the Diplodia as it grows. We have not, however, in its case any evidence of the formation, or suggestion of the operation of any such generally injurious principle, to account for the changes brought about.

So, again, we must dismiss the suggestion that it is an instance of mechanical injury, due to the occurrence of such added material in the tissue that the presence of the fungus mycelium constitutes, much less to any diversion of growth energy to form other tissues, as we find may attend the growth with other parasites in other plants.

The alterations that take place, however, can be precisely ascertained in two ways—(1) by direct observation of the Diplodia-infested maize plant and the interpretation of the facts observed; and (2) by investigation of the facts occurring when the organism is grown under exact control conditions.

Direct observation indicates that there is a loss of substance, indicated by loss of weight found on comparing disease-affected with normal portions of the maize plants; a remark that applies, for instance, to the entire ears, to the grain or kernel, to the cob proper, and again to the grain or kernels attached to it.

Dr. Van der Bijl, in the course of his investigations, inoculated eight ears on growing maize with *Diplodia Zeæ* spores through the silk, and on gathering them 56 days afterwards found, as compared with

a similar number of inoculated ears, that there was an average loss in the weight of ears, after the removal of the husks, of 24·8, and that with respect to the grain the loss in weight in the different inoculated ears varied from 6·7 to 38 per cent., averaging 27·8 per cent. (*vid. op cit.* p. 19, table II.).

Take the grain, for instance, we have previously (*vid.* p. 5) mentioned, that of an Atherton Tableland sample not especially selected, that had experienced a loss in weight of 22 per cent. Now, looking for an explanation of this simple phenomenon of change, microscopically examining the grain in question to this end, we note how this loss has been brought about. In fact, the cell-walls of the fungus-invaded tissues have almost disappeared, and the starch-grains that usually fill the cells themselves, although as numerous apparently as usual, have been partly dissolved and eroded away; both of which changes point to the action of a starch and cellulose-reducing agent of the nature of an enzyme or unorganised ferment diastase. Similarly it has been found that the oil component of affected maize is reduced, suggesting the action of a lipase. (*Note.*—This oil, as we know, is principally yielded by the "germ," a part especially favoured with fatal effects by the parasite; and, as bearing on our statement, the results of an investigation on the part of the Agricultural Chemist, Mr. J. C. Brünnich, of the oil-content of the grain of the original Atherton cobs submitted to us as disease-affected, are of interest. He found, in fact, that its oil-content was only 2·48 per cent., as compared with a yield of 4·2 per cent. by sound maize from the same district, that had yielded it.)

Now, with regard to the bodies formed by the *Diplodia Zeæ* during growth, Dr. Van der Bijl (*op. cit.* p. 54-56), examining the mycelium produced by the fungus when grown under control conditions, has definitely proved by special chemical tests, not only such enzymes as invertase, oxidase, and catalase in the culture medium, but also especially diastase and an oil-destroying (lipoid-destroying) one, lipase. He also ascertained the production, amongst various other bodies, of both glycerine and a special sugar, mannitol. In fact, as derived from the medium for growth by the Diplodia hyphæ or mycelial threads, we must infer the production of liquids and of bodies capable of being taken up by liquids, that, being lost through evaporation when these plant-tissue-contained hyphæ perish and dry up, account for any reduction in weight of affected grain observed (*vid.* p. 5 and this page as above.)

As bearing on this discussion regarding the nature of injury due to *Diplodia Zeæ*, it may be further remarked that the bodies such as are, as is above stated, formed by the progressive degradation of starch and cellulose by enzymes—maltose, galctose, cane sugar, and glucose—constitute when added, in 5 per cent. solution for example, to the fungus grown in a medium of cornmeal, again, about the optimum conditions for its successful growth: "the cultures containing them producing by far the most pycnidia, when compared with other media employed, in cultivating the organism." (Burrill, T. J., and Barrett, J. T., 1909, p. 79.) Thus the researchers of the United States and of South Africa—alike physiological—botanists confirm each other's findings.

SOIL COMPONENTS AND "EAR ROT."

It may be suggested that a deficiency in phosphorus in Atherton soils may be the explanation of Dry Rot disease prevalence there.

However, this question appears to have been disposed of by Dr. Van der Bijl's researches, that have been so often cited here (*cf. op cit.* pp. 30-32), although not directed to one of the kind. In fact, in the course of a series of definite tests regarding the action on the growth and spore-production of *Diplodia Zeæ* of (*a*) various groups of chemical bodies and (*b*) of single ones, he found what may be regarded apparently as a reverse generally of any restraining action of phosphorus, actually occurring in certain cases.

In the tests of more than one in conjunction, he used an approved medium containing 1·5 per cent. Again, with 5 per cent. dextrose, and in testing the single ones, he employed the agar medium alone, with one gramme in 50 c.c. water, of each of the several bodies, entering into the test, as an addition.

His tabulated statements relating to those conditions, as regards chemicals present, that produced the better growth of fungus indicate that when the culture included either ammonium hydrogen phosphate or potassium hydrogen phosphate a vigorous growth ensued—except when potassium chloride was omitted—after 7 days, but that it was very feeble indeed when calcium triphosphate plus potassium chloride was used. On the other hand, without any phosphorus salt whatsoever in the mixture, a growth of only 0·8 as compared with 1 was secured.

Using single chemicals only, the growth when potassium biphosphate was used was equally good to that produced when either potassium sulphate or potassium nitrate was employed. This growth, however, was less when calcium triphosphate was used, and reduced still when ammonium phosphate was the salt employed, in the latter case the growth being very feeble.

INGESTION OF MAIZE AFFECTED BY DRY ROT.

The question of the food value of maize affected by Dry Rot is not a matter for our consideration. However, sickness, and even fatality, in farm animals having been so often apparently traced to their having fed on mouldy corn, or such as has been suspected of being so, the question has arisen, if this, when occurring, be directly traceable to the occurrence of changes brought about by the fungus under consideration, *Diplodia Zeæ* (Schwein.) Lév.

Some years since a fatal epizootic in horses in the Bundaberg-Isis district having, as the outcome of applying the principle of exclusion, caused corn in the form of grain to be inculpated in this connection, several samples of maize grain, at the time of this occurrence and thus under suspicion, were examined by the writer, but in no instance was the parasite in question met with, associated with them. In another, afforded by fatality in coach-horses also, in the Western district, that he too inquired into, death was evidently to be attributed to Ricin yielded by castor-oil seed meal, that was detected by him, as an evidently accidental inclusion.

As immediately bearing on this question, and the possible toxic action of *Diplodia Zeæ*, special researches have been recorded that have not led to positive results.

Dr. P. A. Van Bijl informs us (*op. cit.* p. 5) that in 1914, having prepared in quantity a special culture of the fungus on crushed maize, a definite portion of it was fed to a heifer each day for 8 days, the total quantity consumed being 28 lb., with the result that no signs of illness resulted. This experiment was carried out under the direction of Sir A. Thieler, Director of Veterinary Research, Union of South Africa.

Further, that feeding experiments were conducted, also under the Veterinary Research Division, in which infected mealie cobs, with or without their being first soaked, were fed to calves, sheep, and goats daily during a period of 11 days, but meanwhile the animals remained healthy. Similarly a mule was fed during a like period, until it had consumed 170 lb. of this material, with the same negative results. In fact, in neither case was there even temperature disturbance (*op. cit.* p. 25).

Again, an extract prepared from a pure culture on flour-paste was used to inoculate a white mouse, but no noticeable ill-effects followed (*op. cit.* p. 26). Further, this mouse and two rats were fed with Diplodia-infected maize kernels, but the animals appeared none the worse (*l.c.*). And, further, on making cultures in which several different media were used, the products due to the fungus growth resulting did not include animal toxic principles (*op. cit.* pp. 48-58).

Subsequent to these investigations (1914), and in the light of the fact that cattle in South Africa were still becoming poisoned on feeding in areas devoted to mealie (maize) cultivation, the Union veterinary surgeon, D. T. Mitchell, inquiring into the matter in 1920, apparently arrived at the conclusion that the afore-mentioned findings were to be set aside. Thus, summarising further investigations, he concluded as follows:—"Experimental evidence has shown that cultures of *Diplodia Zeæ* on sterile mealies, when fed to animals, can set up clinical symptoms which are similar to those shown in animals contracting the disease naturally, and further experiments indicate that the results are produced by *a substance of at-present unknown composition* during the growth of the fungus in the maize grain." In this investigation, Mitchell, starting with pure cultures of *Diplodia Zeæ* provided by Dr. Van der Bijl, inoculated sterile crushed maize, and then allowed the growth to proceed for *two months in* (*open*) *jars* prior to feeding it to the animals. (Mitchell, D. T., M.R.C.V.S., Acting Director of Veterinary Research, "Poisoning of Cattle in Mealie Lands," Journ. Depar. Agr. Un. S.A., 1, No. 2, 1920, pp. 138-143.)

Further, on endeavouring to find out if the Diplodia organism cultivated simply on a cellulose medium would give rise to a similar condition of poisoning as did Diplodia-infected maize-cobs, he arrived at a negative result. (Mitchell, D. T., "Poisoning of Cattle by Diplodia-infected Maize," South African Jnl. of Sc. 16 (1920), No. 5, pp. 446-452.)

Now, in the course of the present writer's limited observations, he, as have other workers, has found other fungus organisms besides *D. Zeæ* associated with it in these disease-affected maize ears when taken from the field, notably a species of Fusarium; and, moreover, has met with others, e.g. Penicillium sp. and Aspergillus sp., upon the maize kernels harbouring the Diplodia, that have been taken from ears exposed after they have been husked; and there can be no doubt that maize, in the general condition described as mouldy, has in abundant instances in other countries occasioned sickness, even fatal sickness, to animals

feeding on it, without this being the invariable result. There is in fact an abundance of literature upon the subject; and since *Diplodia Zeæ* itself does not appear to be directly implicated in producing this result, and the chemico-biological reactions, on organic media, of the several associated organisms referred to, so far as they have been prosecuted to the extent of obtaining final results, also apparently are not, it is unnecessary now to further dwell upon the subject, except to add that, generally speaking, the use of all mouldy fodder, and mouldy maize especially, should be avoided.

EXTERNAL CONDITIONS AND THE DISEASE.

METEOROLOGICAL.

According to statements made by farmers to Mr. F. B. Coleman, that had reference to the parts of the Atherton Tableland in which they were respectively interested, the disease was more active in those areas of maize grown in what were denominated wet seasons.

Further, according to the explicit testimony of one, a resident of Kairi, this special virulence appeared to be dependent on another factor co-operating—i.e., the stage of growth that the maize plant has attained when this favouring condition occurs. Thus he stated: "This season, November-planted maize had much rain during March and April when the grain was ripening, while December-planted had the same rain when the crop required it. The November crop gave a very much greater amount of damaged grain." (In the section dealing with Mode of Infection this incident would appear to find its explanation.)

Again, J. J. McDonald, member of the Maize Pool Board, Tolga, is alleged to have stated with regard to the relative incidence of the disease on two areas of forest land, both of which had been long cropped with maize and were seeded with maize from a single source, as follows:—"On 14 acres sown on 3rd November, 1924, there was a crop of 3 to 4 tons of good maize in addition to many damaged cobs present. On 31 acres sown on 19th November, 1924, there was a crop of 21 tons of good maize, in addition to a few damaged cobs present." (*Note.*—In the former case, at the latter rate of yield of good maize, the return should have been 9·6 to 10·6 tons.) The explanation as above may apply here also, but there was another factor to take into consideration: the former area of the two had for a far longer period been devoted to maize-growing.

SOIL.

The soil of the areas devoted to maize-growing on the Atherton Tableland is described as red volanic soil, and apparently therefore it is primarily of a general uniform character; although originally some of the country so used was described as forest land, other as scrub (rain forest) land, accordingly any difference in the incidence of the disease in the various areas must find its explanation in other factors than yielded by fundamental difference in soil—e.g., depletion of plant nutrients. (*Vid.* "Soil Components and Ear Rot," p. 14.) However, its occurrence in both "new land" and "old land" would appear to indicate that the matter of depletion has no determining influence on its presence—a conclusion also based on other considerations that need not now be advanced.

There was, however, a consensus of opinion that the disease was most prevalent in old land that had been continuously devoted to maize-growing, and on this the disease occurrence was apparently a continuous incident—an experience that finds its ready explanation in the fact that, with the mode followed of handling the crop in the Tableland area, the soils must *cæteribus paribus* be becoming yearly endowed with the infective agent, the *Diplodia Zeæ*, in increasing amount.

RECOMMENDATIONS.

It is difficult, with the limitations of our present knowledge, that lacks the guidance or control of full experience of Atherton Tableland maize-growing conditions, to propound a satisfactory course to be pursued in meeting the situation arising from the local prevalence of *Diplodia Zeæ*. The following general principles may, however, be enunciated:—

1. To prevent its continuous presence in yearly increasing amount there should be an intermission in maize growth. This to apply successively, at least, to circumscribed areas that can be regarded as isolated, whether individual fields or more comprehensive areas, as regards spontaneous spread of the disease; but, at one and the same time, to all areas that are accessible to a common source of infection, owing to their contiguity or nighness thereto. This intermission to be brought about (1) by clean-fallowing of the land; (2) raising a cover-crop on it, e.g., cowpea or other plant that may have like value; or (3) alternating with some crop that, like maize, itself yields a merchantable commodity.

2. As subsidiary to the foregoing, the amount of infective material occurring in or on the maize fields should be reduced as nearly as possible to a vanishing point, by in the first place lessening the time occupied in the field with the maize plant for each crop after the cobs are mature, by from two-thirds to three-fourths of that now devoted to "field curing" or "drying off." (*Note.*—At present, owing to the climatic conditions as regards rainfall—drizzle and humidity obtaining on the Tableland—this reduction will probably be found to bring the period into correspondence with that which characterises conditions of maize-growing in certain other districts.) This procedure to involve taking off the crop soon after the grain is mature, transferring the cobs for their drying-out to special "bins" constructed for the purpose, such as are not unknown in handling it elsewhere where corn is grown; the added cost being probably recoverable from an alternate crop with a single year other than maize. Under procedures now in vogue in the district that involve the presence of the crop on the land three or four months after it has matured, it may be anticipated, apart from the occurrence of *Diplodia Zeæ* immediately associated with the cobs already, by the time that the maize crop is removed from the field, every part of the plant already dying, or long since dead, has become the site of secondary infection, or harbours now the spores of the

parasite fungus, whereby its vigorous temporary existence as a saprophytic organism is ensured. Moreover, apart from the advantage accruing to the system contemplated to prevent this, this innovation would meet an important requirement of another character, as obviating an occurrence—as serious in some instances, as a source of loss, possibly, as this "Dry Ear Rot"—for abundant evidence has come under my notice that, in consequence of the present method of handling the harvest in the field, the maize is in many cases already infested with grain weevils, if not already seriously damaged by them, when brought in to be held in store.

3. Arising out of the presence of this infective material on the land, follows the necessity of getting rid of it, and this will not be effected by breaking down the old stalks after removing the ears and cutting them up, and ploughing them under with the farm implements; since, as is elsewhere shown in the report, every piece of old dead maize plant may, if left on the land, prove a source of infection to the succeeding crop of corn, this being even so when cowpea, earth nuts, or some other plant is grown in alternation with succeeding ones, and the land has not been cleaned as recommended.

4. There is no evidence, at present, of any particular kind of maize being immune from or resistant to the attacks of the fungus associated with Ear Rot; but, notwithstanding, there is a pressing obligation, on other grounds, to maintain a high quality in the seed used in planting. There is little outwardly, with but slight infection occurring, to distinguish infected from disease-free seed, and obviously "dead seed" is probably always a carrier of *Diplodia Zeæ* in its tissue, when derived from a crop in which the disease, that it occasions, occurs. This "tainted" seed will not, should it germinate, as only happens when the infection is light, directly give rise to a plant in whose system, consequently, the disease will develop; but, failing to do so, it may, when placed under circumstances favourable to growth of the fungus, yield the Diplodia spores that may prove a source of eventually infecting many other maize plants that otherwise would remain healthy: and "dead seed" will, with utmost likelihood, do so. (*Note.*—Probably this explains how this "Ear Rot" originated in the Atherton Tableland.)

5. There are the best grounds for concluding that the maize plant becomes infected with the *Diplodia Zeæ* when it is silking; also, that this incident is contemporaneous with, or immediately follows, a period of rainfall; also, that the persistence of humid conditions promotes it. An effort should therefore be made to grow the crop to avoid these concurrences.

6. The obligation to consider the occurrence of this disease as a common misfortune in the district, and to regard it, therefore, as one for a common attitude in the prosecution of control measures.

DESCRIPTION OF PLATES 41-44.*

PLATE 41.—Maize Cobs as harvested, showing outward occurrence of *Diplodia Zeæ* (Schwein.) Lév.

Fig. 1.—The husks removed, "White Mildew" involving entirely grain and core.

Fig. 2.—Outer husks alone detached; "White Mildew" involving surfaces of those remaining.

PLATE 42.—Maize Grain or "Kernels" as harvested, showing changes effected by *Diplodia Zeæ* (Schwein.) Lév.

Fig. 1.—Outward appearances, dark patches and "White Mildew." x 2.

Fig. 2.—Sound grain for comparison with Fig. 1. x 2.

Fig. 3.—Internal appearance. Section through disease-affected grain. x 2.

Fig. 4.—Sound grain. Section for comparison with 3. x 2.

Fig. 5.—Starch from disease-affected grain; surface erosion; magnified.

Fig. 6.—Starch from sound grain for comparison with 5; magnified.

PLATE 43.—*Diplodia Zeæ.*—The organism on maize, under moist (field) conditions.

Figs. 1-4.—Fruiting bodies (Pycnidia) emerging or emerged through "White Mildew" (mycelium) covering grain surface, as seen when disease-affected grain is exposed to moisture in field or elsewhere. (Note spore filaments, &c.) x 2.

Fig. 5.—The same on leaf sheath. Natural size.

Fig. 6.—The same on "shank" (stem) of maize-cob. Natural size.

PLATE 44.—*Diplodia Zeæ.*—The organism and its maize-tissue relations.

Infective Agent.

Fig. 1.—Spores (*vid.* Fig. 8).

Vegetative Growth.

Fig. 2.—Mycelial threads (external) or "White Mildew."

Fig. 3.—Mycelial threads traversing tissue cells of husks.

Fig. 4.—Mycelial threads traversing tissue of seed "germ."

(Note thickenings and irregular contour.)

Reproductive Growth.

Fig. 5.—Pycnidium (spore-case) still covered by "White Mildew" or external vegetative form, its spore filament being extended.

Fig. 6.—Pycnidium (spore-case), longitudinal section showing stroma composing pycnidium, and spore containing cavity.

Fig 6A. Spores: successive stages in formation on sporophenes on inner surface (hymenium) of pycnidium cavity. Pycnidium (spore-case), longitudinal section. More advanced stage of growth, the spores being extended.

Fig. 8.—Spores, from spore filaments germinating in moisture; omitting delicate germ-tubes.

(*Note.*—Figs. 1-8 all highly magnified.)

* Prepared, from specimens provided by the writer, by I. W. Helmsing, Artist Assistant.

Fig 1.

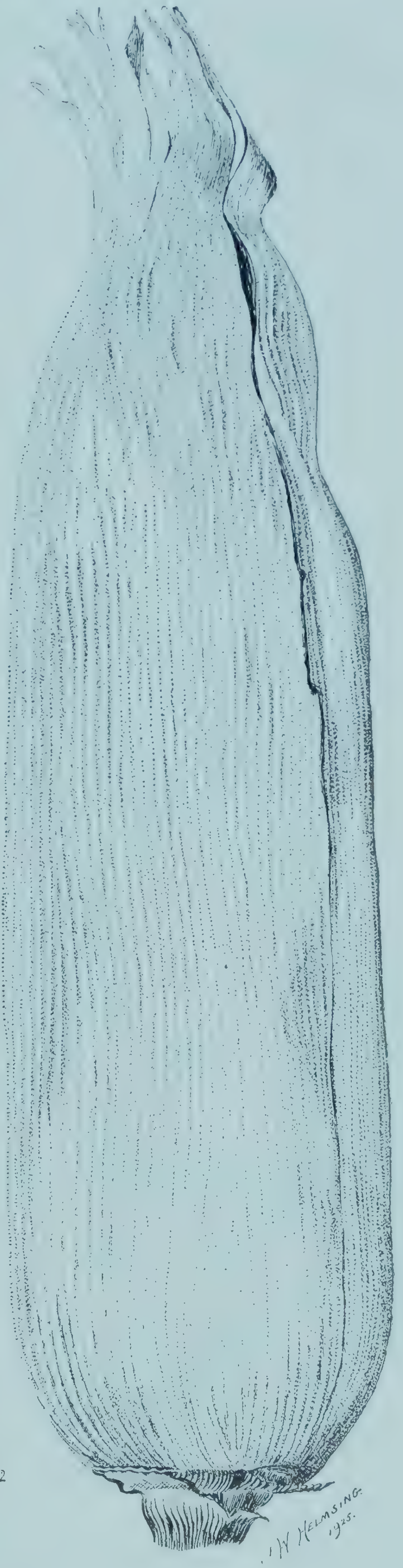


Fig 2

Plate 41.

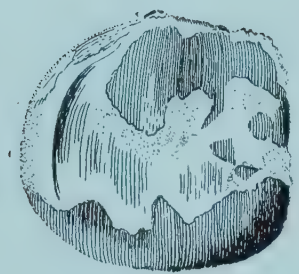


FIG 1.

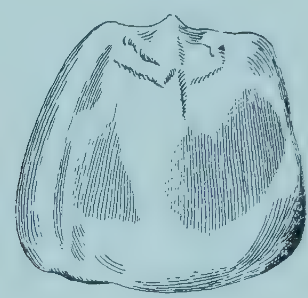


FIG 2.

FIG 3.

FIG 4.

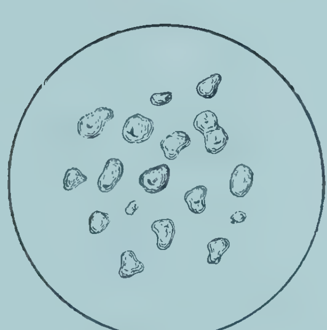


FIG 5

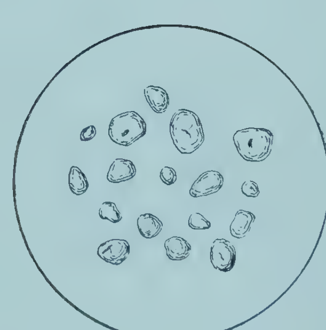


FIG 6.

PLATE 42.

FIG 1.

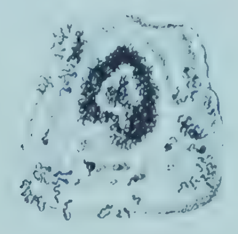


FIG 2

FIG 3

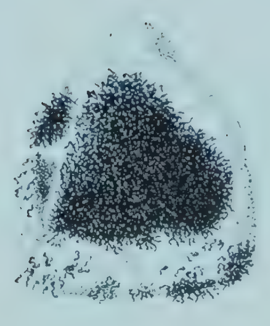


FIG 4

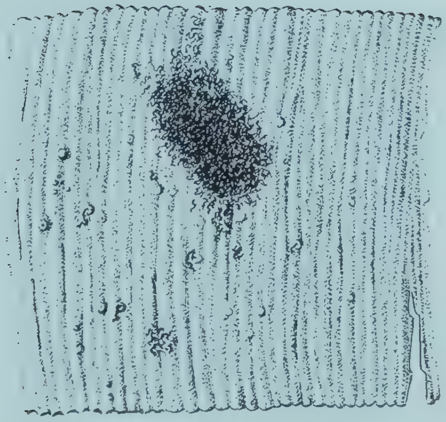


FIG 5

FIG 6.

PLATE 43.


Fig 1
Fig 2
Fig 3
Fig 4
Fig 5
Fig 6a
Fig 7
I.W. Helmsing 1925.
Fig 6.
Fig 8

PLATE 41.

BUNCHY TOP—WHAT IT IS, HOW TO DETECT IT, WHAT TO DO.

BY THE BUNCHY TOP INVESTIGATION COMMITTEE.

This article has been written for the purpose of enabling banana-growers to recognise the disease, known as Bunchy Top, at its earliest stages. It cannot be too strongly urged on all banana-growers that it is the serious duty of every man engaged in the industry in any part of Queensland to examine his plantation at regular intervals, and to report at once any occurrence of the disease to the Department of Agriculture and Stock, Brisbane.

If this is done at once, and, further, the recommendations carried out, there is no reason why the disease cannot be eradicated from any or every plantation in a newly affected area. These notes are also available in pamphlet form.

SOME FACTS ABOUT BUNCHY TOP.

1. Bunchy Top in bananas is a disease due to the presence, in diseased plants, of a germ (so minute that it cannot be seen with the eye under the highest powers of the microscope).

2. Once the disease has made its appearance in any banana plant nothing on earth can remove that disease or cause the plant to recover.

3. Once the disease has made its appearance in any banana plant, in nearly every case all plants or suckers in that stool will develop the disease.

4. The disease can be carried from any diseased plant in a plantation to other plants in that or neighbouring plantations, by means of the dark banana aphis, which occurs wherever the banana plant is grown.

5. The banana aphis does not cause the disease, but serves to carry the disease from one plant to another, in much the same way as a certain kind of mosquito transmits malaria from one human individual to another.

6. The disease takes, generally, about a month to appear after aphides from a diseased plant have been placed on a healthy plant.

7. Consequently you cannot trust any sucker which has been obtained from a plantation in which Bunchy Top is present, or any plantation which is close to a plantation in which Bunchy Top is or has been present; since the plant may be at the stage in which the disease is present, but sufficient time has not elapsed to enable the symptoms to appear.

8. The shifting of suckers out of any plantation affected with Bunchy Top is, in practice, sure to start the disease in any plantation

to which such suckers are taken. Aphides will then serve to carry the disease to other plants in that and neighbouring plantations. In time, unless the following recommendations are carried out to the last letter, the disease will ruin the plantation and even the area in which your plantation is situated.

9. Bunchy Top has been discovered during January in the area between the Brisbane and Caboolture Rivers.

10. Suckers have been sent from this area to all parts of Queensland, even as far north as Innisfail, during recent years, and even within the last two months.

11. The disease is very strongly developed in some plantations just south of the Caboolture River.

12. In some of these plantations it has been present for three years.

13. It has now been proved that in every plantation so far inspected, north of the Caboolture River (as well as south of that river) which has received suckers from a certain one of these badly affected plantations, as far back as 1923 (more than two years ago), Bunchy Top is now present.

14. If you have received any suckers during the past three years from the area south of the Caboolture River, or from any other person who has obtained suckers from that area during the past three years, there is every chance that you may have Bunchy Top now in your plantation.

HOW TO TELL BUNCHY TOP.

(When reading this section, constantly refer to the illustrations at the end of the notes.)

1. Inspect carefully each plant, young and old, in each stool in your plantation at regular intervals.

2. Examine the youngest leaf in each plant in each stool by holding the leaf in such a way that you can see through it from the back of the leaf.

3. If the leaf is diseased there will be seen broken greenish streaks between the veins, that is to say, lines broken into longer and shorter portions, or having the appearance of the Morse Code signs. These will first be seen at the lower end of the leaf, but when the eye is used to it they will be seen throughout the leaf. (See Figs. 1 and 2.)

This is the first symptom of the disease.

4. Sooner or later dark streaks will appear in the stalk of the leaf and in the midrib.

5. If the original plant has been born with the disease, that is to say, has been taken from a diseased corm or bulb, every leaf will show these streaks. (Fig. 4.)

6. If the plant was originally healthy, but has contracted the disease as the result of the germ being carried to it by aphides, then only leaves developed some time after the infection will show the disease. Hence, the safe procedure in all cases is to examine the last leaf, and then you will not miss the disease. (Figs. 5, 6, 7, 8.)

7. In plants born with the disease, all the leaves will from the beginning be narrow, short-stalked, brittle, with curled margin, and stand erect, thus giving the typical bunchy-top appearance, and will, in addition, show plainly the typical green streaking. (See Fig. 4.)

8. In plants which were originally healthy but have contracted the disease, this narrowing of the leaf, short-stalked condition, brittleness, and bunched appearance, &c., will only be seen in leaves which develop several weeks later than the first appearance of the green streaks.

9. If you are careless and do not detect the trouble until plants have got to that stage, you have been giving aphides plenty of time to transmit the disease to other plants.

WHAT TO DO.

1. Observe most religiously the Proclamation just issued, prohibiting the sale of suckers from any plantation unless such plantation and neighbouring plantations have been actually examined and pronounced free from Bunchy Top.

2. If you have received suckers during the past three years from any place south of the Caboolture River, or from any other grower who has received suckers from that area during that time, treat your position as serious.

3. If such is the case, notify the Department of Agriculture and Stock, Brisbane, as to the person from whom you obtained the suckers, the time you received them, and the number of suckers you procured.

4. This information will be of the greatest value in protecting the industry, and in helping you in protecting or saving your plantation.

5. If you treat your own interests seriously enough and offer the information, you will be greatly helped by advice.

6. Carry out at least a weekly examination of each plant in each stool, paying careful attention to the last leaf in each plant, and

observing whether there is any trace of the characteristic broken dark-green streaks in the leaf-blade. A definite day at least each week should be set aside for this purpose, if at all possible.

7. Do not plant out more suckers than can be satisfactorily dealt with in such a weekly inspection.

8. Deal at once with any affected stool as follows:—

(*a*) Spray the whole stool thoroughly, as well as the surrounding soil, with Black Leaf 40, in order to kill any aphides present, and so stop them when disturbed from spreading to other stools. Strength of Black Leaf 40—two egg-cups of solution to a kerosene tin of water.

(*b*) Dig out the stool complete, even if only part is affected, and cut all parts of the plants into slices with a cane knife, or suitable implement. (There is no necessity, nor is it advisable, to carry away such material, which can be left to die on the plantation.) (A very conscientious grower might well give an additional spraying to the cut-up material, and might see that the material is burnt if possible.)

9. Remember that if any one plant in a stool is diseased, the whole stool must be regarded as diseased. Otherwise you will find you are wasting your time by only removing those plants which are diseased in a stool. Remove the whole stool.

10. Success in fighting the disease lies in the earliest detection of diseased stools and their immediate destruction.

11. Growers should encourage their neighbours to follow the above procedure as diligently as themselves, since without such help every assistance is being rendered towards gradually transforming areas now lightly affected into heavily affected areas.

A PROCLAMATION

By His Excellency the Honourable William Lennon, Lieutenant-Governor of the State of Queensland and its Dependencies, in the Commonwealth of Australia.

[L.S.]

WM. LENNON,
Lieutenant-Governor.

WHEREAS by "*The Diseases in Plants Acts,* 1916 *to* 1924," it is amongst other things enacted that the Governor in Council may from time to time, by Proclamation, declare that the removal of any or every tree, plant, or vegetable from or out of any nursery, orchard, or other place shall be either absolutely prohibited or permitted only as prescribed: Now, therefore, I, the Honourable William Lennon, the Lieutenant-Governor aforesaid, in pursuance of the authority vested in me by the said Acts, and with the advice of the Executive Council, do hereby declare that no banana sucker or banana plant shall be removed from or out of any nursery, orchard, or other place in Queensland unless the plantation or garden in which such banana sucker or plant is growing has been inspected within fourteen days of the digging of such sucker or plant, and that such sucker or plant is certified to be free from disease by an inspector: And I do further declare that this my Proclamation is not and is not to be deemed to cancel or in any way affect the Proclamations or any of them made under "*The Diseases in Plants Act of* 1916" and/or the Acts first hereinbefore mentioned, and published in the *Government Gazette* of the twenty-second day of December, 1923, the sixteenth day of February, 1924, and ninth day of January, 1926.

Given under my Hand and Seal, at Government House, Brisbane, this twenty-first day of January, in the year of our Lord one thousand nine hundred and twenty-six, and in the sixteenth year of His Majesty's reign.

By Command, M. J. KIRWAN.

God Save the King!

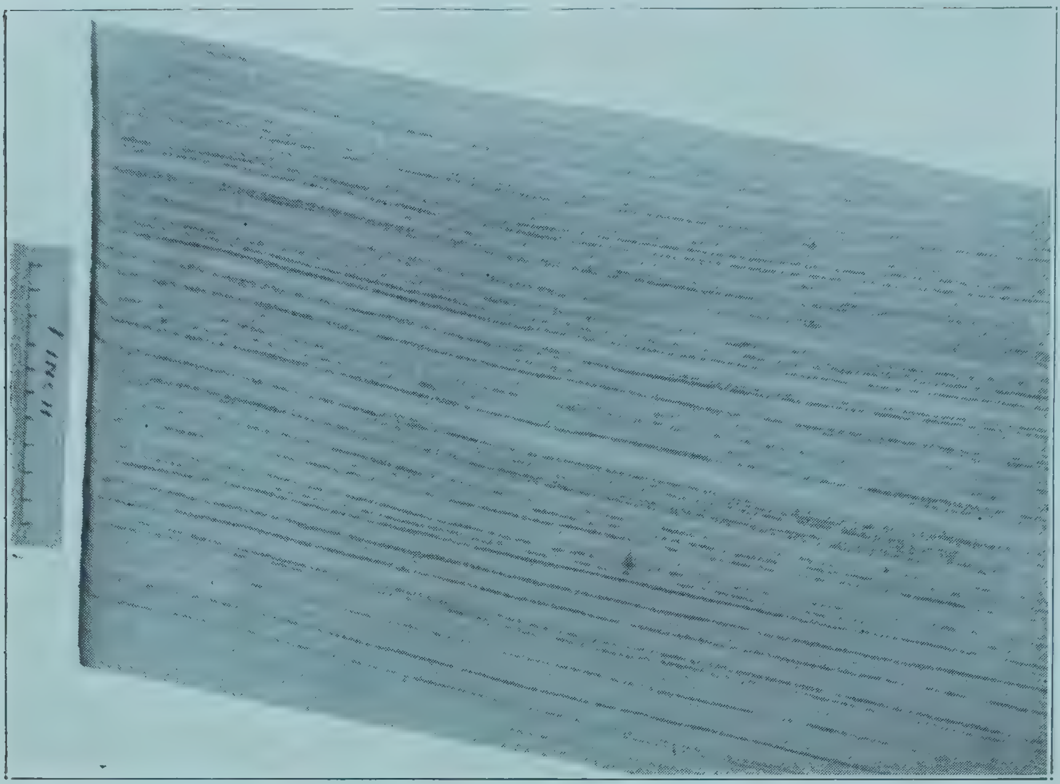


PLATE 45.

Fig. 1.—Portion of the leaf-blade of a Bunchy Top leaf, viewed from the underside, showing advanced stage of the dark-green streaking. The appearance of streaks of this nature, perhaps only four of five in number in the first instance, between the veins of the leaf-blade, is the first symptom of Bunchy Top. When looking for these streaks examine the underside of the leaf so as to allow the light to pass through the leaf.

PLATE 46.

Fig. 2.—Portion of the leaf-blade of a healthy leaf viewed from the underside. Note the absence of streaks in the healthy leaf.

PLATE 47.

Fig. 3.—Several banana aphides (the wingless stage) on the unfurling heart leaf of a young plant. (Photographed natural size.)

PLATE 48.

Fig. 4.—A Bunchy Top stool, eighteen months old, derived from the planting of an infected butt, showing all suckers in an advanced stage of the disease. Note stunting of plants, "rosetting" of the leaves, and the narrowness and upward rolling of the leaf-blades.

Figs. 5 to 8.—Illustrating the development of Bunchy Top in a young plant to which infected aphides had been transferred.

Plate 49.

Fig. 5.—Young healthy plant. Notice the arrangement of the healthy leaves and the appearance of the unfurled heart leaf.

Plate 50.

Fig. 6.—Later, same plant showing an abnormal Bunchy Top and funnel-like heart leaf.

PLATE 51.

Fig. 7.—Later stage in development of Bunchy Top in the same plant. Note the narrowness of the Bunchy Top leaves, their erectness, and the upward rolling of the margins of the leaf-blades.

PLATE 52.

Fig. 8.—Same plant, four months after the appearance of the first symptoms of the disease in the plant, showing the typical "rosetting" of the Bunchy Top leaves.

PLATE 53.

Fig. 9.—Showing a Bunchy Top stool. Note that leaves are bunched together, narrow, and stand more erect than normal.

WHEAT TRIALS IN THE SOUTHERN BURNETT.

By A. E. GIBSON, Instructor in Agriculture.

With the knowledge that a market was available at the Maryborough mill, growers in the shires of Nanango and Weinholt have planted wheat from year to year throughout that rich belt of country running from Nanango to Murgon. Production, however, has not been consistent. Statistical returns show that in the two shires, in 1916, the aggregate area under wheat exceeded 5,000 acres, and in 1919, only 26 acres were cropped, and that the average area cropped with wheat for a nine-year period was 676 acres, which returned an average of 10¼ bushels per acre.

Enquiries show that growers suffered disappointment in the main, from a variety of causes:—

The selection of an unsuitable variety;

From rust and frost;

Through sowing certain varieties at the wrong time of the year to suit their respective periods of development; and

By planting on poorly prepared land which was not in good physical condition to withstand a dry spell.

With the object of determining the suitability or otherwise of a number of new wheats bred at Roma State Farm by the manager, Mr. R. E. Soutter, side by side with a few standard varieties, comparative trials, both in the field and under experiment plot conditions, were carried out by arrangement last season with Mr. F. Gustafson, of Murgon. The soil chosen was typical of the red volcanic friable loams of the district, and the farm, prior to cultivation, was partly forest and partly scrub country. Special attention was given in the preparation of the land, to keeping the surface in a well-worked condition, consequently when the wheat was sown on the 28th and 29th May, an excellent "strike" was obtained. Harvesting took place on the 1st and 2nd November, 157 days from the date of planting. The rainfall was as follow:—

June	312 points
July	69 points
August	209 points
September	145 points
October	Nil.

The total during cropping period—735 points.

Wheats Tested in Experiment Plots.

Commercial Varieties.—Amby, Bunge No. 1, Canberra, Gluyas, and Pusa No. 4.

Roma Wheats.—Waterman, Watchman, Redman, Redchief, Ringer, Radio, Redskin, Amber, Florida, Warrior, Amberite, Marco, Beewar, Pinto, Cedric, Polo, Bindii, Ruby, Pilot, Three Seas, Pacific, Buffalo.

Note.—Watchman, Cedric, and Three Seas are grown in commercial quantities in parts of the Darling Downs and Maranoa districts.

Field Plots, Roma Wheats.—Three-acre plots of Pilot and Florida.

Other varieties planted by Mr. Gustafson.—Gluyas, 6 acres; Florence, 6 acres; Currawa, 3 acres; Roma Red, 3 acres; Pusa No. 4, 3 acres.

As the conditions under which the wheats were grown proved favourable, growth and development of the individual varieties was exceptionally good, the straw ranging between 4 feet and 5 feet in height and carrying well developed ears. Data was obtained of the characteristics of each kind, which will be useful for reference purposes. The results from the field plots showed that when land is well prepared and suitable varieties chosen, good yields in average seasons are to be expected. "Florence" returned 40 bushels; "Florida" 37 bushels; "Pilot" 33½ bushels; "Pusa No. 4" and "Roma Red" 18 bushels each, and "Gluyas" 15 bushels per acre, respectively.

Although some of the yields were undoubtedly good, the clean, well-grown, attractive looking crops were most promising from a hay point of view. Obviously, farmers in this part of the State might well turn their attention to a dual purpose crop, invaluable in such an important dairying and mixed farming centre.

QUEENSLAND PINEAPPLES IN NEW ZEALAND.

The Minister for Agriculture (Hon. W. Forgan Smith) has received from Mr. H. W. Mobsby, F.R.G.S., the Queensland representative at the Dunedin Exhibition, the following report which appeared in the "Evening Star," Dunedin, of 4th instant, regarding the display of Queensland pines at the Exhibition. The journal in question pays a fine tribute to the quality of the Queensland pines and points out the disability under which the Queensland growers are labouring in connection with the New Zealand export market:—

CANNED PINEAPPLES—AN ANOMOLOUS POSITION.

WHY PENALISE AUSTRALIA?

The pineapple, that fine luscious product of the tropics, has always been a favourite fruit when it could be obtained at reasonable prices and in good condition. We do not grow pineapples in New Zealand, but some fine specimens have recently come from Fiji and Queensland and have found a ready sale in the Exhibition. The latest shipment arrived yesterday from Australia and was displayed on the Queensland exhibit in the Australian Court, together with some bananas from the same State.

And in addition to the fresh pines there is here displayed an attractive array of the canned fruit, nicely labelled, and, judging by the sample shown in a transparent jar, of excellent quality.

The question naturally arises: Why do we see so little Queensland canned pineapple in the shops of the Dominion? The answer to this sets us pondering. It appears that for some unaccountable reason the Australian product is handicapped by an extra 10 per cent. duty. While the Straits Settlements may send in their pines under the British preferential tariff of 25 per cent., Australia, on the same class of stuff, must pay 35 per cent.? Again, it may be asked Why? Australia is British just as the Straits Settlements are; she is our near neighbour and our natural kinsmen. Her pines are canned by white labour (mostly returned soldiers), and she packs something like 400,000 cases per year, the quality being absolutely guaranteed by the Queensland State Government.

On the other hand, the Straits Settlements' pines are packed by cheap Chinese and Malay labour, and the conditions under which the packing is done are admittedly not so strictly supervised, while the quality has been declared by many business men here to be inferior to that of the Queensland fruit.

In 1924 New Zealand imported from the Straits Settlements £27,840 worth of canned pines; from Hawaii (American territory) £3,379 worth, and from Queensland £593 worth—or 1½ per cent. of the total imports. Why? Because the extra duty placed the Australian product at an unfair advantage. It is surely only fair and reasonable that the latter should, at the very least, be admitted on an equal footing with similar products from the other British possessions. If this were done Queensland would be quite satisfied to stand or fall on her clean, well-packed, guaranteed pineapples.

AN INTERESTING PLANT.

By C. T. WHITE, F.L.S., Government Botanist.

On going through a collection of plants from Western Queensland collected by Dr. Macgillivray in August, 1923, several plants previously undescribed were found, and several also proved new records for the State. These have now been described and recorded in the last volume of the "Proceedings of the Royal Society of Queensland."

Among the material was a species of Gomphrena which seemed new, and of which a description was drawn up and an illustration prepared. On closer examination, however, it was found to be the same as *Gomphrena leontopodioides* described recently by Dr. K. Domin, a Czecho-Slovakian botanist who travelled extensively in Queensland in 1910 and made large collections. The species is represented in our herbarium from Bulloo River, south of Adavale (Dr. W. Macgillivray, Blackall (R. A. Ranking), and Darr River (C. W. de Burgh Birch).

The genus Gomphrena is widely distributed over the warmer regions of the globe, and fifteen species are natives of Tropical Australia. A species of Gomphrena known as Bachelors' Buttons is common in garden culture; purple and white are the common shades, but others occur.

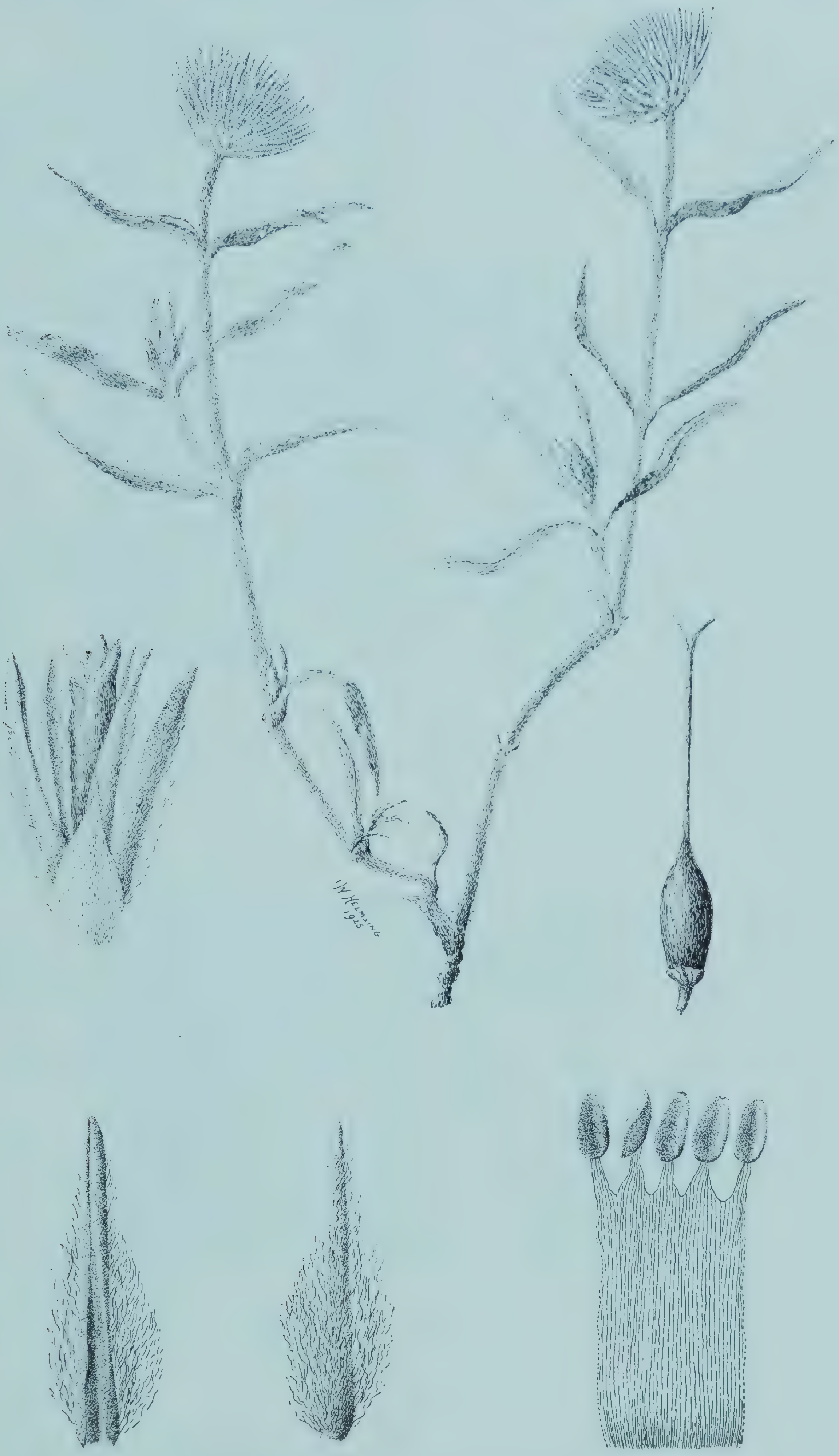


Plate 54.—Gomphrena leontopodioides.

Flower x 3.
Bracts x 4.

Ovary and Style x 4.
Staminal Tube x 3.

POULTRY—MANSON'S EYE WORM.

Mr. Henry Tryon, Entomologist and Vegetable Pathologist, writes:—

With regard to Manson's Eye Worm of chickens, technically known as *Oxyspirura Mansoni* (Cobbold), but originally regarded erroneously as a Filaria, and that has the general habits described by your Proserpine correspondent. This was first brought under notice as occurring in Australia by the present writer (report of Entomologist and Vegetable Pathologist 1907-8), in 1908, he having identified specimens of Chicken Eye Worms, as *O. Mansoni*, that he had received in 1907 from the Herbert River district. He, moreover, then stated:—"Examples of this troublesome nematode were communicated also, previous to 1907, by the Department's Poultry Expert, H. Fern, as fowl parasites unknown to him; he having received specimens from some of our Northern coastal farms—Cairns and Townsville especially. It does not appear that it has been previously identified or remarked as occurring in Australia."

Since 1907, however, S. Dodd, Veterinary Surgeon (1909); Dr. Georgina Sweet, Parasitologist (1910); Dr. A. Bereinl, Director Institute Tropical Medicine, Townsville (1913); and W. Nicholl (1914) have alike treated of its occurrence—in coastal Queensland—but do not appear to have ascertained anything regarding either its biological history, or laid down the treatment of poultry subject to its presence. Although Dr. Sweet seemed to find in it a new kind of Oxyspirura—that she named *O. parvarum*, an opinion not now favoured.

However, 1904, *i.e.*, anterior to these records, B. H. Ramson, of the Zoological Laboratory, Bureau of Animal Industry, U.S.A., devoted a portion of Bulletin No. 60 of the Bureau, to an illustrated account of "Manson's Eye Worm of Chickens," but since then nothing further appears to have been written concerning it—from a broad standpoint. Thus the life history still awaits elucidation, involving, evidently, very difficult research. We know, however, that the male and female parasites occupy together the eye-cavity, living in the interval between the organ itself and the nyctitating membrane that protects it. Also that several of these little white thread-like worms may simultaneously infest the same eye, in fact, as many as 200 have been found in a single one. The female Oxyspirura again lays many eggs, and these persist in the worm until their embryos are developed within them. Ramson discovered that if a female worm with its numerous mature eggs was cut to pieces so as to free these and fluid containing them, then injected into the chicken eye, no development took place, the embryo-worms, in fact, dying. He also discovered that when the eggs were fed to a chicken, a young fowl, and full-grown hen respectively, no parasites could afterwards be recovered from their eyes. As the result of his experiments he concluded as follows:—"It seems probable, however, that it is necessary for the embryos to pass a certain period of their existence either free or in an intermediate host before they will develop to maturity."

With regard to the distribution of Manson's Chicken Eye Worm outside Australia, it has since long been pointed out that generally speaking: "The parasite is restricted to localities bordering on the sea-coast." It was originally met with in 1878, Amoy, China, and since then in Brazil, Mauritius, Jamaica, and Florida successively.

As to the matter of treatment, we have only on record that recommended by Dr. Emmerey de Charmoy (Mauritius), and following him for the most part by the U.S.A. authority. Thus R. H. Ransom writes as follows:—

"The treatment consists in the removal of the worms, combined with the treatment of the associated catarrh. The worms may be removed either by direct mechanical means, as with a small forceps, which operation is more or less dangerous and painful to the fowl, or by irrigating with a solution of bicarbonate of soda, or with a 1 or 2 per cent. creolin solution. The irrigating has the effect of partially dislodging the worms, which may then be removed entirely by wiping away with a soft cloth. Further treatment is directed towards alleviation of the inflammation, or the cure of the catarrh that may have been established. Irrigation of the eyes with a mildly antiseptic solution, such as a 4 per cent. boric acid solution or 1 per cent. creolin solution, is indicated, together with irrigation also, of the nose and mouth, if the nostrils are affected. Anointing the eyes with a mixture of lard nine parts and iodoform one part, or with carbolised vaselin, is likely to give good results in some cases.

"The general sanitary conditions should also be attended to, and stimulating food furnished."

These recommendations regarding treatment were published in 1904. Should any treatment, promising greater effectiveness than it, have been referred to by subsequent writers, and I become apprised of the facts, you will be advised.

MECHANICAL TREE-FELLING WITH A SAW-PLANE.

A French engineer has invented a new machine for the falling of trees by machinery, also plank sawing, &c., which is giving very interesting results. This machine, weighing 270 lb., called "Saw-Plane" by its inventor, has just been adopted by the French Ministry of War, and by most of the French timber and forestry concerns. The process of cutting is quite *sui generis*; the sawing is done per medium of a cutting chain, which encircles the tree and turns at a lineal speed of 7 metres per second. Trees may be cut level and square with the ground. The chain is composed of links bearing each two tracing-knives and a plane, hence the name of Saw-Plane.

PLATE 55.—THE SAW-PLANE.

The sawing speed is about one second per inch of thickness for soft wood and about two seconds for hardwoods.

A poplar bole of 40 centimetres diameter is cut in thirty-five seconds, oaks measuring 90 centimetres, two minutes. The biggest oaks, measuring 1½ metre, take twelve minutes.

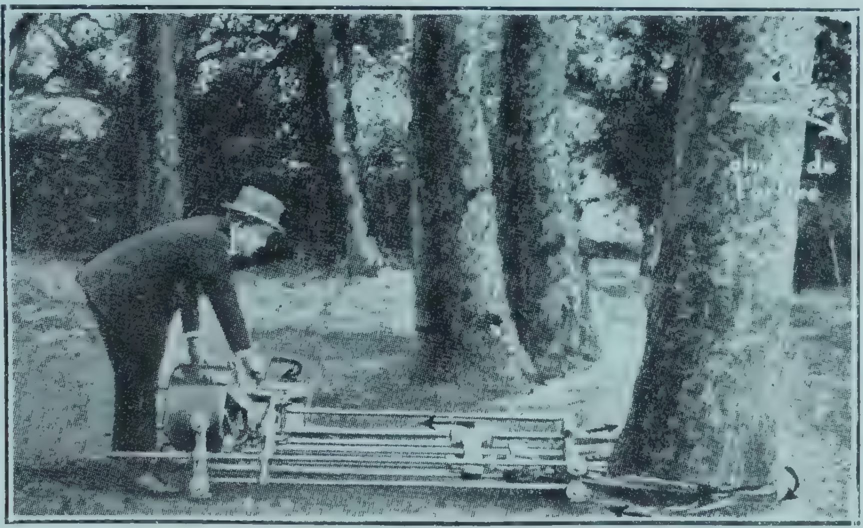


PLATE 56.—THE SAW-PLANE AT WORK. THE TREE IS CUT LEVEL AND SQUARE WITH THE GROUND.

It is worthy of note that the machine falls trees of any diameter with the same facility, and passes from one diameter to another without loss of time.

As the sawing goes on the tree sags on the saw line without jambing the cogs, and it finally falls on the opposite side of the machine. The sawing of a tree with the Saw-Plane does not entail the use of ropes or of a jack, and reduces felling expenses by 75 per cent.

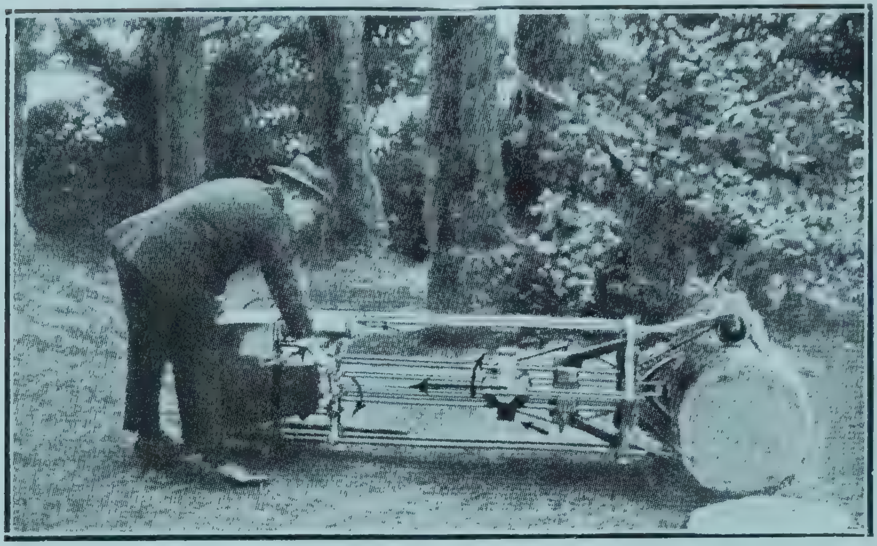


PLATE 57.—SLICING THE FALLEN TREE.

WEEDS OF QUEENSLAND.

No. 41.

RIVINA (*RIVINA LÆVIS*).

By C. T. WHITE, Government Botanist.

Description.—A slender, branching plant 2 to 3 feet high. Leaves on long stalks of ½ to 1½ inches. The leaf itself (blade) ovate-lanceolate in shape, variable in size, 2 to 5 inches long, ¾ to 2 inches wide, dark-green above, paler beneath, veins raised underneath. Flowers small, in slender racemes in the forks of the branches, at first only 1 inch long but lengthening in fruit to about 4 inches; the flowers themselves white tinged with pink, about 2 lines across. Fruit at first white, then pink, and finally a bright red when ripe, fleshy, about ¼ inch in diameter, filled with a red, watery juice and containing a single seed; seed black, about 1 line across, covered with short rather scattered bristles.

Distribution.—A native of Brazil. In Queensland it is found as a weed in coastal localities from Brisbane northwards to the Atherton Tableland. Generally speaking, it occurs along scrub tracks and edges, along fences, &c., where it can get partial shade.

Common Name.—In Queensland, owing to its property of tainting milk, it is sometimes known as "Stinking Weed," a name, however, applied to several strong-smelling plants.

Botanical Name.—Rivina, in honour of Dr. A. Q. Rivinus (born in 1652), for a long time Professor of Botany and Medicine at Leipzig; *lævis,* Latin, meaning smooth, in allusion to the smooth stems.

Properties.—In the "Queensland Agricultural Journal" for February, 1924, Mr. F. J. Watson, Instructor in Dairying, has a note on this weed.*

He states: "The attention of dairymen is called to a weed or shrub which is at the present time a frequent cause of a very serious defect in cream. This plant is not usually eaten by cows, but sometimes in time of drought one or more cows of a herd will take a liking to it, with the result that if their milk is mixed with that of others the whole becomes tainted. The taint is abominable, and is so penetrating that the cream from the milk of a single cow fed on the plant will taint a whole vat of cream and the butter made therefrom; and as cream so tainted is liable to be condemned as unfit for human consumption, it behoves dairymen to be on the lookout for cows addicted to the habit of eating the weed, and to exclude their milk from use for dairy purposes. . . . . Cows that eat the plant are easily distinguished from others by the fact that their milk tastes and smells of the plant, and their excreta give forth a very unpleasant odour."

The plant has several times been received for identification with the report that it gave a very unpleasant odour to the milk of cows that fed on it.

Eradication.—On account of the sheltered position in which the plants grow, hand-pulling or hoe-chipping is the only satisfactory method of eradication.

Botanical Reference.—*Rivina lævis* Linn., Mant., p. 41.

*The weed is referred to an allied plant *Monococcus echinophorus,* but there is no doubt that from his description *Rivina lævis* is the plant referred to, a mistake having arisen in some way. *M. echinophorus* is a scrambling or semi-climbing shrub with burr-like fruits.

PLATE 58.—RIVINA (RIVINA LÆVIS).

ADMINISTERING MEDICINE TO PIGS.

SOME USEFUL RECIPES.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

There is no more unpleasant or even annoying job on the farm than that associated with the compulsory drenching of the pig, this where it becomes absolutely necessary to force the animal to swallow some drug which its somewhat stubborn nature tells it it does not want to swallow and with all effort connected with the administration of which it refuses to accommodate itself. The pig ever was a stubborn brute, it excels itself when it comes to taking medicine. Fortunately, the necessity for the administration of medicine does not often present itself, and these occasions can be separated by a wider space in accord with the care and attention bestowed upon the animal and upon its breeding. There is no royal road to success in pig raising. It has been said that ''half the breeding is in the feeding''; certain it also is that ''half the feeding is in the breeding,'' for a mongrel pig, the scrub hog of the American backwoods, and the bush pig of our own country takes an immense amount of food and gives but little result.

Such medicines as castor oil (the best grade of which is styled ''ol ricini ital'') or raw linseed oil and many powders are best given in the food, the oil in doses of from two fluid ounces (roughly, two tablespoonfuls) for young pigs to four fluid ounces for full-grown animals; and for preference the oil should be mixed with the food and be given as the first feed of the day and whilst the animal is still hungry or thirsty.

All in-pig sows should be given a four-ounce dose of castor oil three days before due date for farrowing, and another dose after farrowing if the bowels are at all costive. If this rule was consistently followed hundreds of sows which die annually at and after farrowing would be saved, and the young pigs would grow and develop to much more advantage.

Preparing a Bran Mash.

To prepare the castor oil for use follow this procedure:—First secure one or two dippers full of wheaten bran (for preference) or pollard, and meal or some waste bread crumbled up, place in a clean bucket; now measure out the amount of oil to be given and pour into the dry bran or meal; mix thoroughly so as to incorporate bran and oil, then thin down to the consistency of thick cream using either warm water or warm skim milk; add just sufficient table salt (say, half a teaspoonful) to destroy the taste of the oil, and give as the first feed of the day. Compel the animal to take brisk exercise about four hours or so after this, and the result will invariably prove beneficial. The bowels will be freed of accumulations of fœces (dung) and digestion will proceed normally.

Many medicines can be given in the food in this way, while such drugs as sweet spirits of nitre (in teaspoonful doses)—than which there is no better remedy for kidney or bladder (urinary) troubles—can be added to the food (slop food) or be given in the drinking water. Where, however, the pigs are so ill that they have no desire for food or water, yet where some internal medicament is necessary, resort must be made to drenches and to a drenching bit (see Fig. 1), drenching horn, (a cow's horn suitably prepared), or at worst to a clean boot or shoe with a hole cut in the point through which, when inserted into the animal's mouth, the medicine can be passed.

Drenching pigs is by no means a satisfactory task, and if the sick animal can be induced to take the medicine in the food or drinking water much trouble and worry will be saved. Never, under any circumstances, persist in giving the drench to the animal if it does not follow freely, otherwise choking and other complications may result. Do not feed or water the pigs for an hour or more after drenching.

Pig Powders, Proprietary Medicines.

Numerous inquiries are received during the course of the year as to whether we recommend the use of proprietary medicines put up in the form of various pig powders. Of such proprietary medicines there are several on the market, notably the much advertised Karswood Pig Powders, Dennis' Canadian Pig Powders, S.S. Worm and Condition Powders, S.S. Lice Powder, S.S. Scour Cure, S.S. Pneumonia Powders, Kossolian Blood Salt, Broncholine, Curdolix, Easakof, Pneumonia, Cough, and Cold Powders, and several others procurable both here and aboard. All these doubtless possess to a greater or lesser extent some virtue and healing power, but one and all will be quite valueless unless their use is accompanied by a thorough clean up of the pig premises, and by improved methods of accommodating, feeding,

and caring for the pigs generally, and even more important still by culling out all unsatisfactory stock, and by the introduction of better stock; stock carrying better quality, better breeding, and greater disease-resisting powers for stock of low vitality and unrecorded breeding are prone to all sorts and conditions of disease, and their use will always be unsatisfactory. Clean out the culls and introduce better breeding stock and the need for medicines will rapidly disappear.

Balloon Capsules.

Probably the simplest method employed in administering worm medicines to pigs is per medium of capsules, those illustrated here (see Fig. 2) being of the balloon capsule type, washed down with a mouthful or two of water. The illustration (Fig. 3) also shows the patent jaw opener for use in injecting these worm pellets, the particular instruments illustrated are styled "Peter's Special Metal Gun and Jaw Opener." The capsules illustrate (Figs. 2 and 3) are also manufactured by the same firm—viz., the Peter's Hog Serum Co., operating in the United States of America. These worm capsules each contain a full dose of liquid oil of chenopodium inside of a transparent soft gelatine shell (the capsule). It is claimed to be the latest method of "worming" pigs, and judging by the extensive sales these products enjoy in the United States they are both simple and efficacious. The special advantage claimed by the inventor of these capsules is that each capsule carries the correct dose; each pig must be treated separately, thus each pig stands so much better chance of being freed from the intestinal parasites, which these medicines aim at destroying. Each capsule carries sufficient oil of chenopodium to dose a pig, weighing from 50 to 100 lb., for heavier pigs two or more capsules would be necessary. Where pigs are heavily infested with worms the dose would need to be repeated in four or five days' time. So far these worm capsules are not available on the Australian markets, but supplies could readily be obtained from overseas if required. They will be tested out during the year and a report published later on. The directions for use are simple. First, fill the special gun (Fig. 3) with water, insert the capsule, open pig's mouth with special jaw opener, and squeeze bulb injecting the capsule over the back of the tongue forcing it down the pig's throat with the water. Care is, of course, necessary to prevent choking. Fig. 4 shows another type of hog holder for use in handling heavier pigs.

Drenching the Pig.

No attempt should be made to dose or drench a pig suffering from diseases of the respiratory passages (bronchitis) or lungs (pneumonia, pleurisy, &c.), as in these diseases the respiratory organs are inflamed and very sensitive and tender, and the animal is likely to choke in swallowing the fluid. If the fluid penetrates into the substance of the lungs serious complications would result. In any case when meidcine must be given per medium of a drench, the animal must be properly restrained preferably by being first caught, a loop of strong rope or webbing passed through his mouth behind the tusks and over his snout, securing the rope to a stout post or rail in such a position that the head can be lowered immediately if required.

When giving the medicine, which must be done cautiously, permit ample time for the animal to swallow each mouthful, and lowering the head immediately if there is any indication of choking or obstruction.

If the animal weighs less than 100 lb. an attendant should catch the pig and straddle him with his back between the holder's legs, at the same time grasping both front legs and raising the pig's head sufficiently high for the drenching horn or shoe to be placed in position.

It is preferable to give fluids through a tube or by means of a horn or shoe, as in this way little or none of the medicine will be wasted. It is certainly advisable to "gag" the animal by first inserting a small piece of soft wood between the upper and lower jaws, thus allowing room for the shoe or horn to be passed into the mouth.

When the medicine is in the form of a powder and has to be given in this way it is better to mix it with a small quantity of honey or treacle, and if necessary flour, making the mixture fairly thick, then place sufficient on a long handled ladle or spoon (using the handle end), or a piece of soft wood slightly grooved out to carry the mixture; in these cases also great care must be taken to deposit the mixture on the back of the tongue, otherwise it will not be swallowed.

Most medicines can be given in the form of ball, capsule, or pill, and when these are being prepared on the farm they should be mixed in a small ball of moistened flower or pollard and be given to the animals in this form.

The Use of the Hypodermic Syringe.

Some drugs must be administered per medium of the hypodermic syringe. In diseases such as those affecting first the muscular and nerve tissue (cases of snake bite, for instance) where a quick-acting drug is necessary, it is preferable to have the drug given in this way, but in these cases a qualified veterinarian should be engaged to do the work, for if such medicines are not correctly administered or if an overdose is given the results may be disastrous.

The Administration of Vaccines, Serums ; Vaccination.

Fortunately for the Australian pig raiser we are not troubled with the more serious infectious or contagious diseases such as hog cholera (here called swine fever), swine plague, swine erisepelas, anthrax (pigs), foot and mouth disease, or rinderpest, so that wholesale vaccination with hog cholera serums, mixed infection serum or virus, &c., is not necessary. This form of treatment appears to have become a necessity under American conditions, and, in some instances, also in the United Kingdom and on the Continent. No attempt should be made to inject serums or virus into pigs unless it be strictly under official instructions from the Chief Inspector of Stock or veterinary officers of the Department of Agriculture and Stock, Queensland, or the Chief Inspectors of Stock in the other States. It is specially urged in all cases of doubt as to the nature of disease from which pigs are suffering, that the advice of the veterinary officers should be immediately sought.

We have to thank our somewhat strict and rigid quarantine regulations and our qualified veterinary officers for the comparative freedom from disease of stock in this country. It is to be hoped that we may long remain as free from contagious diseases as we are at present, especially in so far as pigs are concerned. Climatic conditions also favour healthy stock, and in this regard Queensland is especially favoured.

Rectal Injections, Enemas.

Rectal injections commonly referred to as enemas are sometimes used in the treatment of pig diseases, especially in severe cases of constipation or bowel stoppage or of diarrhoea or other bowel affections. Enemas usually consist of warm soapy water to which possibly some form of oil (olive oil, salad or lucca oil or glycerine) has been added, but no irritating drugs should be given in this way, otherwise the bowel tissue may be injured. Irrigation of the uterus and womb of breeding sows for diseases of these organs is also frequently recommended.

Administration of Drugs by Inhalation ; Fumigating.

The administration of drugs through the air passages by inhalation is also sometimes advised. Occasionally chloroform or other anaesthetic is administered, but in all these cases a special knowledge of the methods that are to be employed is necessary, and it pays to employ a "vet."

Treatment for Skin Diseases.

The application of remedies for the treatment of skin diseases and for the purpose of freeing the skin and hair of parasites (hog lice, &c.) is a different and a much more simple process, even when dipping is necessary, though dipping is rarely advised in the case of pigs, for they can be sprayed to much more advantage. Care should be taken in all cases to see that the mixtures applied have been properly compounded and that no drugs of an irritating nature have been used.

A simple and efficient mixture for the treatment of hog lice is made up as follows:—Mix together benzine ½ pint, kerosene ½ pint, fish or neatsfoot oil 7 pints. This lice mixture should be stored in a glass or tin container and should be suitably labelled. Apply by hand or per soft cloth, brush, or spray after the animal has been washed and freed from accumulations of mud and filth. As the lice eggs (nits) already deposited will hatch out in three days' time a second application of oil, three or four days after the first, is necessary. Further applications of the mixture in a month or so, and then occasionally, should keep the pigs free from infestation. Young pigs from one or two days old upwards are specially subject to infestation, and they should not (they are, however, often neglected) be overlooked when treatment is being arranged for.

Peculiar Ear Disease.

In cases where the pig is suffering from that peculiar disease of the ear of the pig technically known as "Suppurative Otitis" in which the pig carries his head on one side and appears partly paralysed, see special pamphlet on this subject obtainable on application to the Department of Agriculture and Stock, Brisbane.

Abscess Formation.

In cases of abscess formation after castration, technically known as "Schirrous Cord," see special pamphlet now in course of preparation on "The Castration of Pigs," also obtainable on application to the department.

USEFUL PRESCRIPTIONS.

A Reliable Healing Ointment.

The following prescription is well worth keeping on hand. It is a reliable healing ointment for application to open wounds such as those resultant upon castration or operations on abscesses, &c. The wound should first be thoroughly cleansed before applying the ointment, and until healing takes place the pig should be isolated from the rest of the herd in a clean, dry well-bedded sty. The ointment should be kept in a clean porcelain or glass container suitably labelled, and should be on hand at all times in case of emergency. Any chemist would make up a couple of shillings worth. The recipe is as follows:—Iodoform 1 part, oil of eucalyptus 14 parts, oilve oil 20 parts.

The following prescription has proved very efficient as an internal irrigant (a wash) for syringing the uterus and womb of breeding sows who fail to hold to the service of the boar. Recipe: Chinosol 15 grains, glycerine 2 ounces, distilled water 6 ounces. Use two ounces of this mixture in a pint of warm water (previously boiled) and inject per enema syringe daily for several days before service by the boar. This remedy has proved very effective in the case of milch cows, and it is well worth trial with breeding sows.

Treatment for Pigs Suffering from Inflammation of the Lungs (Pneumonia), Catarrh, or Common Cold.

In these cases careful feeding and comfortable housing is the best remedy, as indeed it is in most pig diseases. Isolate sick animal in a warm, dry, well-bedded sty protected from draughts, use plenty of clean soft bedding daily; give only soft laxative nourishing food (gruel, &c.), green foods and milk, and plenty of fresh clean water. An occasional ounce packet of Epsom salts dissolved in the drinking water will be helpful, as also will one teaspoonful of sweet spirits of nitre given in clean drinking water. Compel animals that take regular exercise daily to keep bowels and bladder in good order.

In cases of pneumonia and pleurisy, a plaster of mustard and olive oil smeared over the ribs and chest and covered with brown paper and a light rug may be effective.

Colic and Gastric Troubles.

In cases of colic, usually resulting from gastric troubles, severe indigestion, &c., in which severe abdominal pain is manifest, follow treatment. First give only light nourishing gruel, *i.e.*, milk with a small quantity of bran to make a light bran mash; secondly, the addition of one or two ounces of castor oil in warm milk or in the mash, the latter if the animal is eating well, or give as a drench if necessary (up to 4 ounces of oil in severe cases in grown stock). Keep the animal warm and quiet, and follow with careful housing as already advised. Repeat the castor oil (adding a few drops of chlorodyne if the pain is still manifest) if the animal is constipated.

Constipation.

In cases of constipation follow advice given above *re* feeding, housing, &c. Change diet, giving plenty of soft succulent green food (lucerne, &c.). Compel the animal to take regular and brisk exercise to relieve bowels and bladder. This is a very common trouble with breeding sows close to farrowing and bacon pigs being forced along in the fattening stages with corn. Give castor oil as above recommended, and in severe cases where the dung is hard, scanty, and clay coloured, first give two or three ounces of Epsom salts in warm water as a drench, and follow with extra castor oil or raw linseed oil. In very severe cases resort must be made to enemas of warm soapy water to reileve the passages of accumulations of dung. Use water at a temperature of 104 deg. Fahr., and add an ounce of olive or castor oil or glycerine to the water.

Diarrhœa or White Scour.

A special pamphlet has been prepared on this subject; this gives all the information available. It is available on application. In young pigs not yet weaned the trouble is due usually to overfeeding of the sow and to the fact that the suckers are taking more milk than their digestive organs can cope with, thus gastric troubles are set up and bowel disorders result.

Lumps or Pustules on the Legs and Feet.

In cases where lumps or pustules and abscesses form on the legs and at the joints, and in cases of multiple abscesses generally, write the department, giving full description of the trouble. These cases are largely due to wet, cold sties and to a form of rheumatism.

Protrusion of the Rectum, Piles, Prolapsus Ani.

In cases of protrusion of the rectum more commonly referred to as piles or protrusion of the mucous membrane of the rectum, in which the mucous membrane protrudes as a dark purple swelling under the tail, diet must first receive attention, all "grassy" foods, whey, butter-milk, meat soup, must be cut out of the ration. Constipation or diarrhoea must be relieved by giving oil as suggested above. The protruding portion of bowel should, early in the attack, be well washed for ten minutes with warm water to which has been added a disinfectant such as Lysol, then besmeared with olive or carbolised oil and be returned to its normal position, and, if necessary, held in position by bandages. Very little food should be given (such as a drink of light gruel) and that of a laxative nature.

If straining continues, give a dose of from 10 to 60 drops of chlorodyne or 30 drops of laudanum in a small quantity of warm water, the larger dose in the case of a bacon pig or an animal carrying more age.

If necessary in these cases enemas of warm soapy water are worth trial. Prevention must be accepted as better than cure.

Inflammation of the Udder (Garget) and Milk Fever (So-called).

In these troubles treatment must first aim at relieving the udders of milk, two, three, or more times per day. Give the sick animal two ounces of Epsom salts with 4 to 6 drachms of sulphur in a warm bran mash. When possible foment the udder with hot water and then massage gently with the fingers and apply the following ointment:—Extract of belladonna 1 drachm, gum camphor 1 drachm, vaseline 3 ounces. If the teats are very sore the sharp black "needle" teeth of the suckers should be cut off with a small pair of pliers (see Figs. 5 and 6) and the following mixture applied as a lotion to the sow's udder two or three times a day:—Sulphate of zinc 5 drachms, acetate of lead 5 drachms, distilled water 1 pint. These remedies have all been recommended, and in some instances suggested by the veterinary officers of this department, and can be regarded as efficient yet not costly.

Inflammation of Prepuce (Sheath) of Young Boars.

This trouble in young boars is not uncommon. Treatment must first aim at cleansing the parts by fomenting with hot water and disinfectant. (Use 1 teaspoonful of phenyle to 1 pint of water.) Keep the urinary opening free of accumulations of dirt and syringe out the sheath with the same solution. Repeat treatment daily, and squeeze out all urine regularly until recovery takes place. In severe cases it may be necessary to open sheath to facilitate syringing, but in case of a valuable animal the veterinary surgeon had better attend to this. See Fig. 7, young boar suffering from this affection.

Sunstroke—Heat Apoplexy.

In cases of sunstroke or heat stroke (apoplexy), in which the animal frequently lies in a comatose condition as if death had already taken place, treatment must first aim at having the animal removed to a cool, moist atmosphere, near a water trough in the case of a overheated bacon pig at a saleyard or trucking station. Pour cold water first on mouth and snout, then on face and head, moisten the ground on which the animal lays, but do not pour cold water over body. When an improvement is noticed a wet bag may be placed over the body, but this is not advisable till improvement takes place. The animal must be kept very quiet. Bleeding is often resorted to, the ear being slit or the tail cut off above the brush to allow of the loss of a certain amount of blood, but though this may be effective as a temporary relief, the loss of blood weakens the animal considerably and the result may be fatal. Avoid overdriving the animals, for in these cases, as in all other disease conditions, prevention of the trouble is far better than any cure.

Paralysis of the Hindquarters.

In cases of paralysis of the hindquarter, rickets, and similar diseases. A special pamphlet is available at the Department of Agriculture and Stock, Brisbane, dealing with these diseases, and readers are advised to secure a gratis copy. Reference is made in this pamphlet both to the several causes and to suggested methods of treatment.

Intestinal Parasites.

For long round white worms "Ascaris Suilla" (see Fig. 8) note the following. See references earlier in this article to the use of oil of chenopodium capsules, &c. Where capsules are not available, treatment must first aim at keeping the animal without food for from twelve to twenty-four hours.

The following prescriptions are useful:—(1) Give ½ to 1 teaspoonful of oil of turpentine in a cup of warm milk as a drench, followed immediately by a two-ounce dose of Epsom salts. Repeat dose in a week if thought necessary.

(2) An alternative treatment is 1 teaspoonful of turpentine, 20 drops of liquid bichloride of iron, and 4 ounces of raw linseed oil as a drench.

A very reliable remedy tested out extensively at American Agricultural College piggeries is as follows:—A powder is given composed of santonini 8 grains, calomil 2 grains, bicarbonate of soda 1 drachm, arnica nut powder 2 drachms. Note.—If santonini is not procurable, increase calomil to 3 grains in making up mixture. This is one dose for a pig weighing 100 lb. It is best given in the form of a ball of moist pollard when the animal is very hungry and be followed by a 2-ounce dose of castor oil.

For lung worms (*Strongylus paradoxus*), small round worms about ½ to 1½ inches in length infesting the lungs: Follow advice already given *re* isolation, housing, and feeding. The veterinary surgeon had better attend to treatment, as it involves treatment by inhalation; this necessitating a form of fumigation by burning sulphur, &c. Fortunately, our piggeries are practically free of lung worms, and it is rare that treatment is necessary.

For kidney worms (*Schrostoma punguicola,* also called Stephanurus dentatum). This worm inhabits the kidneys, and becomes embedded in the kidney fat and in other organs. Reference is made to its development in the pamphlet on "Paralysis of the Hindquarter," for it is popularly supposed, but frequently erroneously, to cause this disease. There is no reliable medicinal treatment. Preventive measures only are advised. The same may be said of the thorn headed worm (*Echinorrhyneus figas*) (see Fig. 9), a similar type to the ascaris, but more difficult to treat, and of the whip worm (*Tricocephclus crenatus*) inhabiting the large bowel, and the pin worm (*Oesophogastoma dentatum*). The several remedies already suggested may be effective if persisted in, but preventive measures must always occupy a prominent position in any form of treatment. Where pigs are properly cared for intestinal parasites do not cause much trouble.

Food Poisoning.

This trouble, technically referred to as "Botulism," results from the use of an oversupply of some irritant, such as salt water (water in which corned beef, pickled pork, or ham has been cooked), or of soda water, lye, hot cabbage water, very hot soup, &c. One of the most prominent symptoms is severe abdominal pain resulting from inflammation of the stomach and intestines; diarrhoea is also usually present and the animal may suffer from convulsions and partial paralysis.

Where valuable animals are to be treated a veterinary surgeon should be called in, for treatment must be prompt to be effective. Preliminary treatment consists of giving the animal repeated doses of white of egg well beaten up or four ounces of olive oil in a cup of warm fresh milk. If lead poisoning is suspected—*i.e.*, where the animal has had access to waste paint, paint pots, the lead lining of tea chests (which they sometimes chew), give repeated small doses of Epsom salts in addition to above. A further article dealing with this subject will appear in an early issue of the "Queensland Agricultural Journal."

Mange, Scab, Nettlerash, Itch *(Sarcoptes Scaba).*

In cases of skin diseases of this description treatment consists in first softening and removing the scurf and scales with soft soap and warm water, repeated washings, and applying the following lotion every day or two until cured:—Flowers of sulphur 3 ounces, potassium carbonate 1 ounce, neatsfoot oil 1 pint. Mix while the oil is being warmed.

In cases of ringworm (*Tinea tonsurans*) which are comparatively common on the udders of breeding sows, and of cow pox on their udders and teats, repeated washing and painting with a dilute solution of tincture of iodine is advised, also the application of carbolised vaseline. The various forms of skin diseases require different treatment, hence if the outbreak is severe call in the district stock inspector or obtain advice from the veterinary officers.

In cases of treatment for hog lice (*Haematopinus suis*) the veterinary staff also advise the following:—After disinfecting, cleaning up, and lime washing sties, give the animals careful attention, nourishing food, and as an alternative treatment apply the following lotion:—Stavesaen seeds 1 ounce, water 20 ounces. First bruise the seeds and boil in water for two hours, afterwards making the mixture up to the original quantity—20 ounces. Another dressing they advise is flowers of sulphur 3 ounces, potassium carbonate 1 ounce, neatsfoot oil 1 pint. See further particulars *re* this dressing under heading of mange.

If a large number of pigs are infested with lice and the dressing of individual animals is too laborious, a dip or bath is recommended containing the following ingredients:—10 lb. slaked lime, 22½ lb. sulphur, 20 gallons water. Use in proportion of one part of the mixture to three parts of water.

The lime and sulphur should be mixed together in a smooth paste by the addition of a little water. This paste should then be thoroughly stirred into the 20 gallons of boiling water, and the mixture kept at a slow boil for three hours, or until it becomes a dark orange colour. If the mixture is properly made, there should be no sediment, but if a sediment occurs the mixture should be strained. For ordinary purposes it is used in the proportion of one part of this mixture to three parts of water at a temperature of 105 deg. Fahr. Repeat the dipping or spraying—for it can be used as a spray—in eight days if necessary. In all cases of skin diseases and of infestation by parasites disinfection and lime washing of pig premises is absolutely necessary.

Prolapsis Uteri.

Breeding sows as a result of difficulty at farrowing sometimes experience further trouble in that the breeding bag (the womb) falls away from its natural attachments and protrudes from the vulva in much the same way as does the mucous membrane of the rectum in "Prolopsis Ani." It appears as a large purple sac protruding from the mouth of the vulva. Sows in this condition frequently die before help arrives. Treatment must aim at immediately cleansing the parts and replacing them as advised under the heading Protrusion of the Rectum, Piles. Great care must be taken to keep the sow very quiet and clean, on very light diet, and to see that both the bowels and bladder are free. With care and attention there is no reason why recovery should not take place.

Dropsical Conditions.

Pigs sometimes suffer from dropsy. Fig. 10, p. 286, illustrates a Middle Yorkshire sow suffering from dropsy of the womb. When after death we post mortemed this sow we took between twelve and thirteen gallons of fluid from her abdominal cavity. This is a disease which the veterinary surgeon should be called in to attend if an animal was unfortunate enough to develop the trouble. The writer recently post mortemed a Berkshire boar at Kingaroy who had developed dropsy almost as severe as this Yorkshire sow.

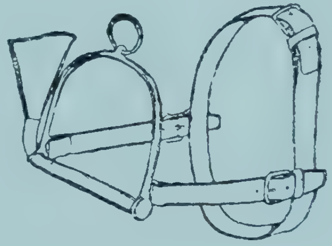


PLATE 59.

FIG. 1.—A suitable type of Pig Drenching Bit of special value to the breeder of valuable stud pigs. The bit is inserted in the pig's mouth, and the straps are passed round the head at back of the ears. It simplifies drenching.

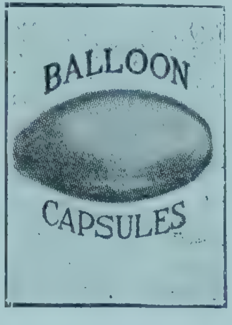


PLATE 60 (Fig. 2).—THE BALLOON CAPSULE READY FOR USE.

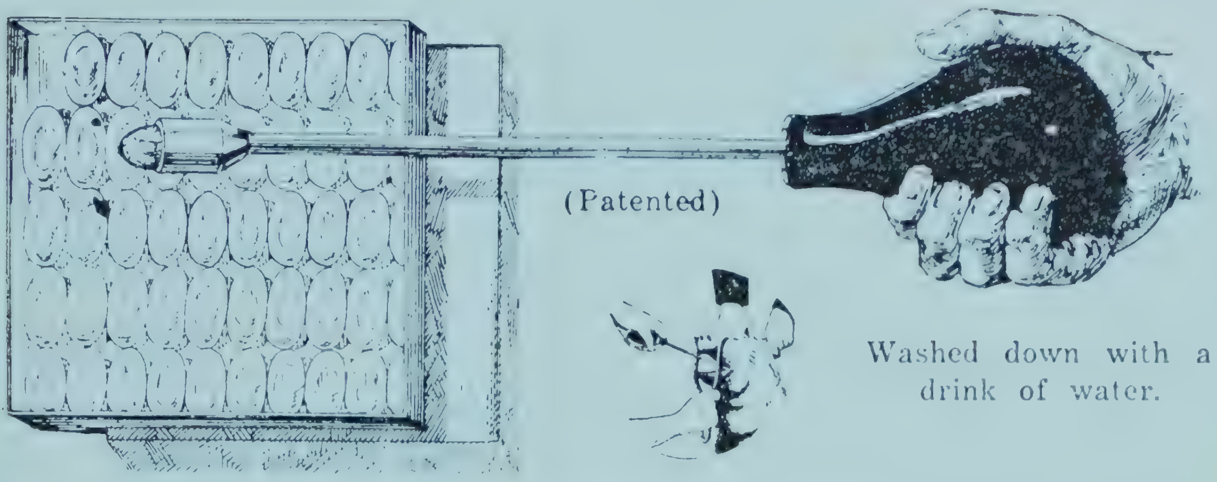


PLATE 61 (FIG. 3).—PETERS' BALLOON CAPSULE OUTFIT.
(Showing the patent metal gun, jaw opener, and box of capsules.)

PLATE 62.

FIG. 4.—A convenient instrument for inserting into the pig's mouth in order to hold him whilst being drenched or operated on. This is a very strong instrument, enabling the operator to handle a heavy sow or boar with comparative ease.

PLATE 63 (FIG. 5).—NIPPING OFF THE SHARP BLACK "NEEDLE" TEETH OF A SUCKING PIG.

Removing these teeth does not affect the pig injuriously, yet it saves the sow much pain and annoyance, for when the suckers fight for their place at the teat they bite and injure the teats as well as injuring their own tongues and lips. It is good practice to remove these needle teeth.

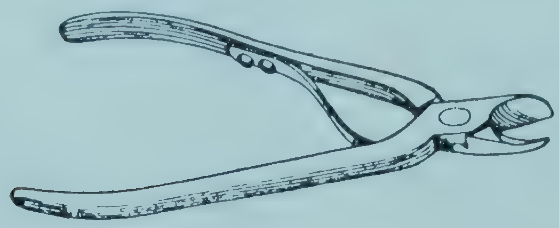


PLATE 64 (FIG. 6).—A PAIR OF PIG TEETH NIPPERS.

Quotations for instruments of this description can be obtained from manufacturers or retailers of veterinary appliances.

PLATE 65 (FIG. 7).—YOUNG BOAR SUFFERING FROM INFLAMMATION OF PREPUCE (SHEATH).

A common trouble among boars from six to twelve months old.

FIG. 8.—Well developed specimens of the Long Round White Worm of the pig technically known as Ascaris Suillae. These worms vary from 8 to 12 inches in length, are white in colour, and are as stout as a piece of No. 8 fencing wire. This is the commonest of the parasites infesting the intestines of the pig.

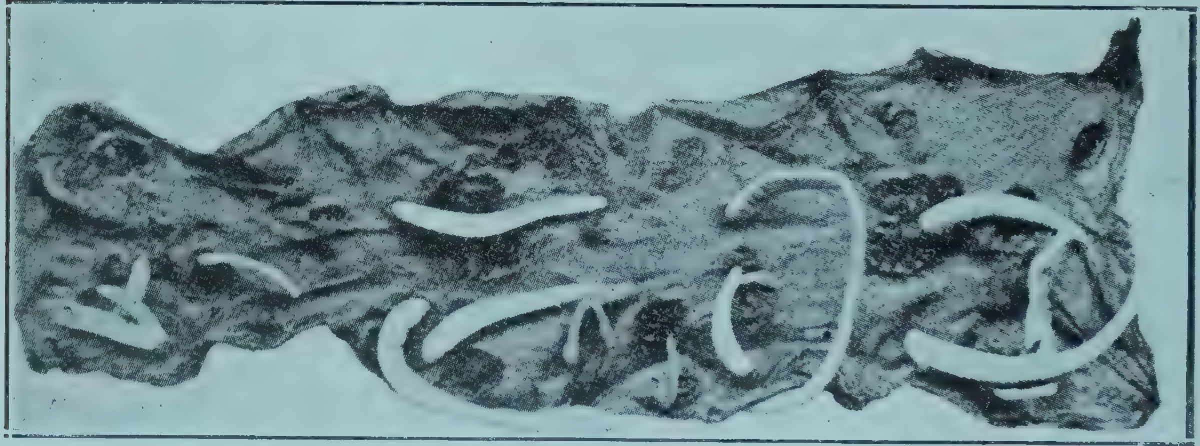


PLATE 66.

FIG. 9.—Portion of pig's intestine, showing Thorn Headed Worms attached to the mucous membrane of the intestines. These worms are provided with a set of hooklets by means of which they attach themselves to the walls of the intestine while their feeding apparatus is forced into the mucous membrane. Thus they feed on the nutrients, being absorbed into the system from the food stream. These worms vary from six to twelve inches in length. They are pinkish white in colour. Those illustrated were much shrunken and were immature when this photograph was taken.

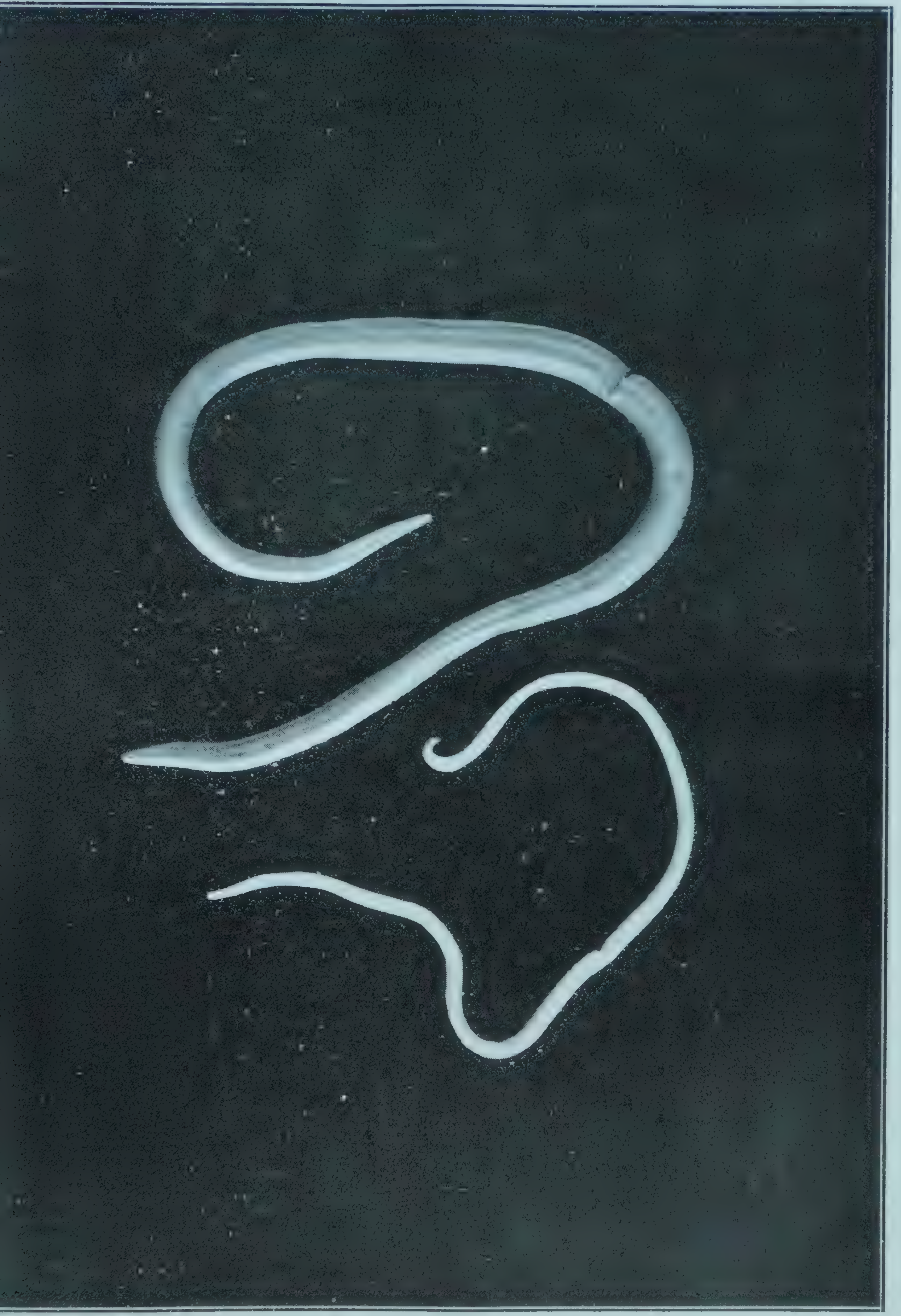


Plate 67 (Fig. 8).

PLATE 68 (FIG. 10).—BACK VIEW OF MIDDLE YORKSHIRE SOW SUFFERING FROM DROPSY OF THE WOMB.

The sow died a few days after this photograph was taken.

PLATE 69 (FIG. 11).—ANOTHER VIEW OF THE SOW ILLUSTRATED IN FIG. 10.

She had a long and painful illness and lost condition. When opened twelve or thirteen gallons of fluid was taken from her abdominal cavity. An unusual disease and one from which pigs rarely recover.

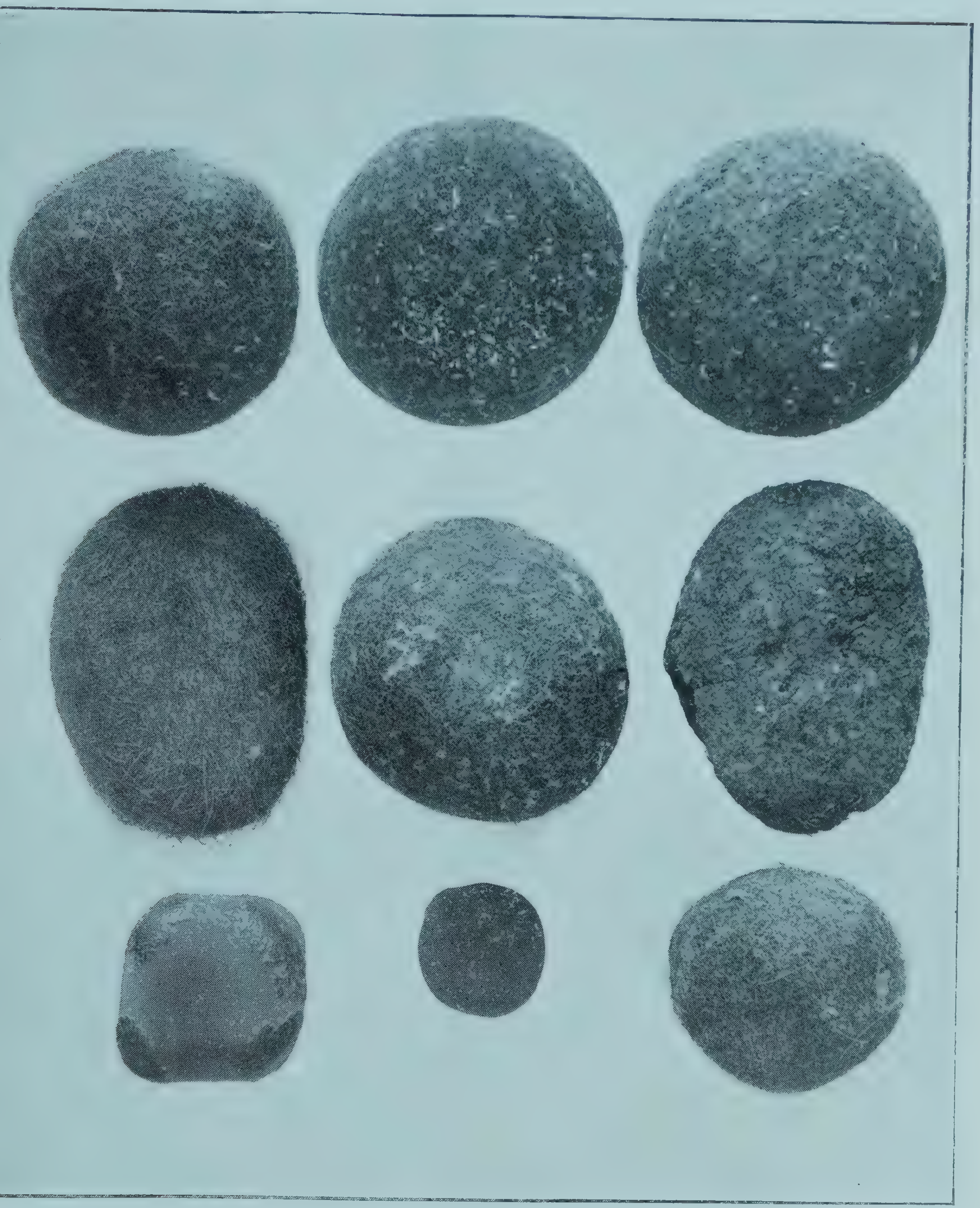


Plate 70 (Fig. 12).—Hair Balls from the Stomachs of Pigs and Cattle.

These hair balls, technically known as "Trichobezoars" are composed of fibrous matter, hair, wool, and a certain amount of earthy matter. The top row were each about as large as a tennis ball, the middle row from the stomachs of pigs (one each) were about the size of an oval cake of toilet soap, while the lower row varied from the size of a golf ball to slightly larger. The two to the left in the lower row were composed of very fine earthy matter compacted together. These were collected by Mr. Slaughtering Inspector E. C. Todd, of Cairns, and the Instructor in Pig Raising.

WOOLLY APHIS AT STANTHORPE.

Reports received by the Chief Entomologist (Mr. Veitch) indicate that very satisfactory progress has been made in the distribution of *Aphelinus mali*, a valuable parasitic enemy of the Woolly Aphis (*Eriosoma lanigerum*); this beneficial insect was introduced to the Stanthorpe district some time ago by the Department of Agriculture and Stock, the colonies being received from the Cawthron Institute, New Zealand. The parasite successfully overwintered in 1925 in most of the orchards in which it had been established earlier in that year, and from late in September to the end of December a series of colonies totalling 5,000 individual parasites has been distributed, mainly to those orchards in which this beneficial insect had not previously been liberated, and Mr. Jarvis (the Stanthorpe Departmental Entomologist, who has been in charge of this work) is able to report that "This useful parasite is now established in practically every orchard in the Granite Belt, and accounts of the good work it is accomplishing are continually reaching us." Information is also to hand to the effect that the parasite has spread into New South Wales orchards situated 30 miles from Stanthorpe.

PARASITIC WORMS WHICH INFEST THE DIGESTIVE ORGANS OF POULTRY.

By P. RUMBALL, Poultry Instructor.

A large number of animal parasites are found in the digestive tract of poultry, some of which cause serious disturbances of the digestive functions, while others again are apparently harmless. Those principally met with, however, can be classed as round worms (nematoda) and tape worms (Cestoda). The former variety, by reason of the fact that they are the most common, claim prior attention. Various varieties are found in the crop and provintriculus or glandular stomach, gizzard, intestines (both upper and lower portions), and the ceaca or blind gut. The latter variety are responsible for serious losses and are particularly hard to expel. The accompanying plates should give poultry-breeders some idea to what extent infestation is possible.

Plate 71.—Dispharagus Nasutus which Infests the Provintriculus or Stomach of Fowl (natural size).

That portion of the digestive tract between the crop and gizzard known as the provintriculus, or glandular stomach, is shown in Plate 1, heavily infested with worms. These worms were more or less encysted in the walls of the stomach, causing ulceration and eventually rupture.

PLATE 72.—SPIROPTERA HAMULASA, GIZZARD WORM OF FOWL (NATURAL SIZE).

From the above plate the nodules caused by the gizzard worm are illustrated. On examination of the lining of the gizzard perforation will be noticed, and on removal of the lining the end of the worm will frequently be seen protruding from the muscular tissue. They are difficult to extract complete and vary considerably in size.

PLATE 73.—GIZZARD WORM (NATURAL SIZE).

PLATE 74.—INTESTINE OF ORPINGTON HEN WHICH DIED OF STOPPAGE DUE TO TUMOUR AND BALLING OF WORMS.

This plate illustrates possibly one of the most common of intestinal parasites met with in poultry, and also the harm ensuing on their unchecked multiplication. In all probability the tumourous growth was due to parasitical infestation.

Life History of Round Worms.

It is not intended to trace in detail the life history of the various round worms found in poultry—in fact, in many cases it is unknown—but briefly with those most frequently met with. The adult female lays her egg in the digestive tract which is voided in the excreta. This egg undergoes portion of its development in the soil, enters the digestive tract of poultry by adhering to portions of food, and there completes development. In order that correct development of the embryo worm takes place while it is in the soil, moisture is necessary, which accounts for the more general infestation met with in damp and wet yards. Numerous post mortem examinations have been made by the writer of unthrifty stock due to the presence of worms, and from conditions disclosed he is forced to the conclusion that propagation may take place by certain varieties of worms in the infested host itself. A study of the illustration on p. 288 lends colour to some extent to this theory.

Plate 75.—Long Round Worms (natural size) which were Removed from Intestines of Bird illustrated in the Plate on the preceding Page.

Preventive Methods to be Adopted to Avoid Infestation.

Having a general idea of the life history of round worms, what action can be taken to prevent general infestation? As worms are spread from bird to bird by eggs, infested stock should never be brought on to relatively clean premises. As the eggs are found in the excreta from infested stock, particular attention should be devoted to the regular cleaning up of droppings; by doing so you not only assist in preventing the spread of worms, but preserve your fowl manure in its most valuable form. It is impossible to thoroughly clean the runs attached to poultry buildings, but they can be spaded over occasionally and, where accommodation allows, spelled. The feeding of all mash foods, foods to which eggs would readily adhere, should be done in suitable receptacles, and where large numbers of birds are yarded together several should be provided to prevent portions of the mash from being spread about the yard.

Worm-infested stock are poor producers, and where infestation is severe the vitality of the birds is lowered, rendering them more susceptible to disease. Young chickens when hatched are of necessity free, and every effort should be made to maintain them in this condition, particularly so during their growing stage. To do this they should be reared on ground which has not been fouled by adult stock. Do not make use of chicken rearing pens, brooder houses, &c., as temporary quarters for stock of any kind; by strictly adhering to this principle it is possible to place in the laying pens well developed stock that will give results. On the other hand, if growing

PLATE 76.—DREPANIDOTÆNIA INFUNDIBULIFORMIS.

a.—Worm;
b.—An inverted piece of chicken's intestine with numerous tapeworms attached.

stock become infested their growth is retarded and their vitality so lowered that they fall easy victims to diseases of an epizootic nature, such as roup and chicken pox, both of which are prevalent during the growing period and frequently assume a more virulent form with this class of stock.

Diagnosis.

The symptoms which indicate the presence of worms are not very characteristic. The birds become dull, weak, emaciated, and sunken in face, losing all colour both in head and legs. The plumage loses its lustre and becomes roughened. Where infestation is not severe they are ravenous, but with the increase of worms their appetite diminishes, and they have no inclination to look for food. Their walk becomes stiff, and diarrhœa is often present. Generally birds infested with worms have the appearance of suffering from some chronic disease.

Medicinal Treatment.

Too much reliance must not be placed on the ease with which worms can be expelled by medicants, as the best are only partially effective. Therefore it should be the aim of producers to avoid infestation by every means in their power. Santonin is undoubtedly the best vermifuge, but, unfortunately, it is too costly for general use. If used, give at the rate of 1 to 5 grains per bird in the mash. Tobacco dust has been used also with some degree of success by mixing 1 lb. with every 50 lb. of mash.

Medicated oil of turpentine mixed with equal quantities of cotton seed oil or linseed oil can be given by means of a syringe, in doses of one or two teaspoonfuls according to the age of stock. In administering this, every care must be taken to prevent its entering the wind pipe.

Before administering any of the following, fast the birds for twenty-four hours, then follow treatment in two hours by giving Epsom salts at the rate of 1 oz. to fifteen adult or twenty half-grown birds.

Tape Worms.

There are many species of tape worms found in fowls. They, however, cause little trouble owing to severe infestation being rare. The tape worm requires an intermediary host. One of the species infesting poultry has for its intermediary host the common house fly, and another the earth worm. An excellent treatment for tape worms is oil of male fern, areca nut, or powdered pomegranate root bark. A heaped teaspoonful of the latter added to the mash for fifty birds occasionally will keep stock free from tape worms. Areca nut given in the mash at the rate of 10 grains per bird is also efficient, while oil of male fern should be given at the rate of 10 drops per bird. However, before administering any of the above the birds should miss a feed and medicinal treatment should be followed by a purge in two hours.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1926 AND 1925, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1926.	Jan., 1925.
North Coast.	In.		In.	In.
Atherton	11·55	24	11·80	10·54
Cairns	16·18	43	21·83	10·21
Cardwell	16·48	53	3·52	13·09
Cooktown	14·68	49	7·25	5·50
Herberton	9·46	38	11·26	9·10
Ingham	15·73	33	3·12	14·48
Innisfail	20·12	44	14·51	13·43
Mossman	14·05	17	12·82	18·03
Townsville	11·28	54	3·75	10·95
Central Coast.				
Ayr	11·51	38	1·42	7·81
Bowen	10·02	54	3·46	6·08
Charters Towers ...	5·66	43	2·64	9·46
Mackay	14·75	54	3·40	6·93
Proserpine	16·30	22	2·65	10·54
St. Lawrence ...	9·82	54	5·48	5·70
South Coast.				
Biggenden	5·28	26	2·93	8·00
Bundaberg	8·96	42	2·90	13·66
Brisbane	6·29	75	3·01	7·49
Childers	7·59	30	2·27	10·78
Crohamhurst ...	12·56	30	9·15	11·86
Esk	5·40	38	7·24	8·64
Gayndah	4·68	54	1·61	5·83
Gympie	6·62	55	2·07	11·80
Caboolture	7·43	38	4·10	9·12
Kilkivan	5·53	46	1·14	5·65
Maryborough ...	7·38	53	4·91	13·79
South Coast—continued:	In.		In.	In.
Nambour	9·01	29	10·36	15·36
Nanango	4·49	43	4·43	7·62
Rockhampton ...	8·69	38	3·94	7·62
Woodford ...	7·22	38	7·01	10·01
Darling Downs.				
Dalby	3·31	55	4·41	5·83
Emu Vale ...	3·13	29	3·43	5·33
Jimbour	3·60	37	4·84	7·92
Miles	3·79	40	6·07	3·84
Stanthorpe ...	3·55	52	3·90	6·69
Toowoomba ...	4·86	53	4·84	6·53
Warwick	3·52	60	5·48	6·17
Maranoa.				
Roma	3·36	51	1·70	2·22
State Farms, &c.				
Bungeworgorai ...	2·27	11	1·32	2·11
Gatton College ...	4·06	26	...	4·18
Gindie	3·77	26	3·10	7·60
Hermitage ...	3·00	19	6·01	5·21
Kairi	7·48	10	18·14	8·30
Sugar Experiment Station, Mackay	11·56	28	3·62	5·85
Warren	5·76	11	5·42	2·14

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January, 1926, and for the same period of 1925, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

General Notes.

Nitella, Characeæ as a Possibie Mosquito Preventive.

Nitella is a genus of Characeæ, several species of which occur in Queensland waters, growing round the edges of ponds. The plants grow completely submerged and root in the mud. Attention was first drawn to the matter by Caballero, a Spanish scientist working with Chara foetida, and the inference he drew was that some toxic substance harmful to the mosquito was secreted by the plants. Experiments conducted in Morocco, Spain, and Madagascar supported the theory, it being thought that the natural water in which Characeæ often grow does not harbour the larvæ whether Chara is present or not. The matter is still somewhat doubtful, so that experiments conducted in Brisbane by Mr. Buhot, one of the inspectors on the staff of the Commonwealth Department of Public Health, have considerable interest. Mr. Buhot, using a species of Nitella (sp. not yet described), found that the aquarium with the Nitella growing in it was always free from mosquito larvæ, and even when eggs and larvæ were artificially introduced into the water they failed to develop. Control tanks alongside were full of "wrigglers." The water used in all cases to fill the tanks was the ordinary town supply.

Payment for Peanuts by the Peanut Pool Board.

The following communication on the subject from the Secretary of the Pool, Mr. W. Muir, of Crawford, Kingaroy line, has been received:—

"At the annual meeting held in November growers were acquainted with the position, and they were told that sales would extend into the New Year, also that a tremendous increase in the demand for seed was likely. Quite a lot of the growers have been told that it is the intention of the Board to pay in full as early as possible, early February most likely, which, of course, would include money for seed. This is being arranged so that no injustice will be done, and the grower who is unable to pay for his seed will simply pay interest on it, the Board having complete security in the coming crop. Some growers either do not know or wilfully misunderstand the position, but there is a coterie who would for selfish ends like to see the pooling system go down. The year the Pool came into force one grower hawked a few sacks he had around Roma street and elsewhere with practically no results; however, the Pool looming up scared buyers into buying and sellers into selling, so that this grower cleared his stocks. Although some of the discontented growers have been knocked about by the Pool (according to their statement), every one of them have much larger areas under peanuts this year than ever. Owing to the smallness of last crop the position has been much harder to handle. In this way we have had to distribute a small crop to practically the same amount of customers, only in lesser quantities, consequently the returns have been much lower than could have been had we had a good crop, which means that it takes longer to get in enough money to enable a further advance being made. No doubt this entails a certain amount of sacrifice on the part of the grower, but in the interests of the future possibilities of the industry it is imperative. The bulk of the growers are reasonable when the position is explained to them."

Sorghum and Pigs.

There is a certain amount of risk in feeding "second growth" Planters' Friend and other varieties of sorghum to stock prior to the stage at which the plant flowers and the seed heads form, this especially so during humid weather with the very young shoots of the second growth. It is not advisable to feed sorghum to stock before the seed heads form, for prior to this stage the plant has not matured, nor is it as appetising or nutritious as is the case after flowering.

Some authorities consider that, provided the young sorghum is cut and allowed to wilt for twenty-four hours before use, it can be fed without risk, but is is preferable to follow the advice given above and allow the plant to mature before cutting it for stock feed. Both types of sorghum—viz., the Sweet Sorghums and the Grain Sorghums—provide excellent crops for pig feeding purposes, the grain sorghum being grown solely for the grain, which has a feeding value similar to other cereals, such as maize and wheat, although stock appear to prefer maize and barley to any other cereal grains if they have their free choice of them. In Queensland saccaline has proved an ideal crop for pig feeding, so also has improved cow cane and the softer varieties of sugar-cane.

Staff Changes and Appointments.

Mr. S. H. Fraser and the Police Magistrate Ingham have been appointed Government representatives on the Aramac and Kennedy Dingo Boards respectively.

Mr. W. Ellison, junior, of Bald Knob, Landsborough, has been appointed an inspector under the Diseases in Plants Acts.

Mr. J. C. Pryde has been appointed temporary inspector of Stock, Brands, and Slaughterhouses, and will be stationed at Charleville.

The Officer in Charge of Police, Mount Coolon, has been appointed an Acting Inspector under and for the purposes of "*The Diseases in Stock Act of* 1915" and "*The Slaughtering Act of* 1898" as from the 11th February, 1926.

Mr. Gerard Guy Greaves, Wamuran, has been appointed an Inspector under "*The Diseases in Plants Acts,* 1916 *to* 1924," as from the 13th February, 1926.

Regulations *re* Citrus Fruits.

Approval has been granted by the Lieutenant-Governor in Council to certain additional regulations under "*The Fruit Marketing Organisation Acts,* 1923 *to* 1925," empowering the Committee of Direction of Fruit Marketing to make a levy on all citrus fruits marketed for the year ending 28th February, 1927.

Removal of Banana Plants.

As a further protection against Bunchy Top in bananas, a new proclamation has been issued, declaring that no banana sucker or plant shall be removed from any nursery or orchard or other place in Queensland unless such plantation or garden in which such banana sucker or plant is growing has been inspected within fourteen days of the digging of such sucker or plant, and that such sucker or plant is certified by an inspector to be free from disease. Certain districts have, however, been previously proclaimed from which it is unlawful to remove any banana or plant under any conditions. The proclamations respecting these districts are still in force.

Special Levies.

Owing to the reorganisation of the Council of Agriculture on a commodity basis and the dissolution of the various District Councils, the Council of Agriculture has been given power, by regulation, to receive moneys supplied by means of certain special levies, which levies were formerly imposed by the District Councils mentioned below:—

Stanthorpe District Council.—Levy at the rate of 10d. per ton of all fruit and/or vegetables consigned by them or on their behalf from any railway station in the Petty Sessions District of Stanthorpe to any place outside such district.

Mackay District Council.—Levy of 2d. per ton of all sugar-cane delivered at the Farleigh and Cattle Creek Sugar Mills, and 1½d. per ton of sugar-cane delivered at Plewstowe Mill.

Mackay District Council.—Levy at rate of 7d. per ton of sugar-cane from the Homebush area and delivered at the Farleigh and North Eton Central Sugar Mills.

The abovementioned levies will only be collected by the Council of Agriculture until the respective dates on which they were to expire when collected by the District Councils.

Grade Standards for Apples and Pears.

In pursuance of the provisions of the Fruit Cases Acts, provision has been made for the grading of apples and pears. Three grade standards have been fixed—"Special," "Standard," and "Plain"—and all apples and pears offered or intended for sale shall be graded into such standards, particulars of which can be obtained from the Department of Agriculture and Stock or from the Committee of Direction of Fruit Marketing.

"Matured Fruit."

For the purposes of the Regulations under the Fruit Cases Acts, "matured fruit" has been more clearly defined. In the case of pineapples, fully developed fruit during the months of April to September inclusive shall contain not less than 8 per cent. sugar content, and during the months of October to March inclusive not less than 10 per centum. In the case of oranges and mandarins, the citric acid content shall not exceed 1½ per centum; and in the case of deciduous stone fruits, the kernel must be matured inside the stone and the fruit must not be picked when the kernel is in the jelly stage. The fruit may be still hard and firm, but shall have attained its full growth, and the skin must give an indication of the colour of the particular variety.

Local Sugar Cane Prices Boards.

The term of office of members of the Inkerman, Invicta, Kalamia, Mourilyan, and Pioneer Local Sugar Cane Prices Boards has been extended to the 28th February, 1926.

Milk and Cream Testing.

Result of examination in the Theory of Milk and Cream Testing held at various centres on the 21st November, 1925:—

Moodie, Archibald Faine, High School and College, Gatton.
Coleman, Frank Clifford, High School and College, Gatton.
Schroder, Carl Alexander, High School and College, Gatton.
Baker, Walter S., H.T., State School, Malanda.
Davidson, John, H.T., State School, Sarina.
Christian, Clifford Stuart, High School and College, Gatton.
Atherton, David Ord, High School and College, Gatton.
Stubbersfield, E., care of Butter Factory, Murgon.
Porter, Thomas J., High School and College, Gatton.
French, John Leslie, Kelvinhaugh, *viâ* Dalby.
Lehfeldt, John Cousins, Kalapa, *viâ* Rockhampton.
Brimblecombe, Victor Joseph, High School and College, Gatton.
Anderson, Alexander Milne, State School, Mount Mee, *viâ* D'Aguilar.
Vogler, Cyril Reginald, Butter Factory, Boonah.
Ralph, Norman Thomas, "Avondale," Cooroy.
Hobgen, Thomas, State School, Sugarloaf, Stanthorpe.
Aplin, William, High School and College, Gatton.
Menery, Hal, High School and College, Gatton.
Volz, Herbert John, Caboolture.
Moller, C., care of Wide Bay Co-operative Dairy Co., Gympie.
Shea, Wilfred Matthew, Conlon street, Roma.
Logan, Martin Patrick, Wilson street, Paddington.
Volker, Herbert Justus, Westbrook.
Harvey, James Peel, High School and College, Gatton.
Kelly, Michael John, Rosevale, *viâ* Rosewood.
Bilborough, Arthur Wheeler, Springbrook, *viâ* Mudgeeraba.
MacHardy, Robert, High School and College, Gatton.
Hale, John Francis, Moola Cheese Factory, Kaimkillenbun.
Wallis, William Donald, Herries street, Toowoomba.
Dawson, Arthur William H., Butter Factory, Dalby.
Feckner, Walter, Pittsworth Dairy Co., Linville.
Tadman, F. W., 119 Fitzroy street, Rockhampton.
Newton, Stanley William, Doctor's Creek, Haden.
Mullins, M., Bony Mountain, *viâ* Cunningham.
Francis, Stephen Collier, Second avenue, Wilston.
Murphy, Arthur, Barrett street, Booval.
Geoghegan, William, Boonah.
Soutter, George Vincent, Silvermist Cheese Factory, Malanda.

Poisoned Baits for Flying Foxes.

An efficient poison bait for flying foxes can be made as follows:—With a packing needle thread some apples on a length of binder twine, and out of each apple scoop a small conical piece, using a small sharp-edged spoon for the purpose. In the opening so made a small quantity of strychnine is deposited. To ensure a correct amount for each apple a measure may be made by pushing a pen nib, point inwards, into an ordinary penholder. So much strychnine as will remain on the reverse end of the nib should be spread into the hole in the apple, and the cone-shaped piece that had been cut out replaced. The bait should be prepared, if possible, twelve hours before it is to be used in order that the strychnine may have time to affect the whole apple. The apples being thus poisoned, they should be securely tied to the branching top of a long sapling. Select a tree that the foxes have been visiting, strip it of fruit, and at sundown tie the sapling to the tree so that the top projects above the tree itself. This method is also effective where parrots are doing damage in an orchard.

Caution.—The great drawback is the danger that attaches to the use of the poison. Every precaution should be taken to keep children out of the orchard, and notices should be conspicuously displayed on every boundary. Special care should be taken that the poisoned fruit is securely tied on so that the flying foxes or parrots cannot carry it away and drop it where it may be eaten by children or stock. The poison should be kept in a plainly marked bottle and under lock and key; similarly the prepared apples must be securely locked up until it is time to tie them to the trees.

Opossum Boards.

An Order in Council has been issued constituting opossum districts in the State. These districts, which approximately comprise that portion of Queensland east of the 144th meridian of longitude, are as follows:—

Moreton, Darling Downs, South-Western, Wide Bay and Burnett, Central Coast, Central Western, Northern Coast, Northern.

Provision is made by regulation for the constitution of a Board for each district to consist of three members—one appointed by the Government, one to be elected by landowners, and one to be elected by the trappers. Triennial elections are provided for.

The election of members of the Boards for all districts will be held at the Department of Agriculture and Stock, Brisbane, on the 19th April, 1926, and the date of nomination has been fixed for 12th March, 1926.

Bitter Bush, Quinine, or Native Cinchona Eradication.

Alstonia constricta or Bitter Bush eradication is best carried out by poisoning the plants with arsenical solution. Standing trees may be ''frilled'' by making a succession of downward cuts right round the tree into the sapwood, each cut overlapping the other so as to leave no unsevered bark or sapwood for the conveyance of food-containing sap for the tree. The solution should now be freely poured into the frill with a watering can (without a rose) or old teapot or kettle.

Bitter Bark suckers freely, and the eradication of sucker growths in paddock or cultivation areas is more difficult; the suckers might be cut down, however, and a solution painted over the cut stumps with a brush or swab. These also, of course, can be grubbed out, and constant grubbing will exhaust the old roots eventually. An arsenical solution poured round the grubbed plant would no doubt be effective, but would poison the ground for some time for all other plants.

A suitable solution is: Arsenic 1 lb., caustic soda 2 lb., or washing soda 3 lb., water 4 gallons. The soda is necessary to help the arsenic dissolve, and the addition of whiting is recommended because it dries white and shows which trees or plants have already been treated. If ordinary washing soda is used boiling will be found necessary to bring about complete solubility, but if caustic soda the heat generated does away with the necessity of boiling.

Proposed Cotton Board.

The Department of Agriculture and Stock advises that the following nominations have been received for election as Growers' Representatives on the proposed Cotton Board:—

District No. 1 (Lockyer District).—James Scanlan, Flagstone Creek; Ferdinand A. Kajewski, Ma Ma Creek.

District No. 2 (from Helidon to Toowoomba, Darling Downs, Maranoa, &c.).—John F. E. Olm, Brigalow; Edw. V. Little, Miles.

District No. 3 (from Brisbane to Ipswich, Brisbane Valley Line, South Coast Line, and North Coast to Gunalda and Branches).—David C. Pryce, Toogoolawah; Chas. Litzow, Vernor.

District No. 4 (Gayndah-Mundubbera Line).—Donald B. Greggery, Mount Lawless; James Bryant, Chowey Siding.

District No. 5 (North Coast Line from Theebine to Gladstone and all Branches except Gayndah-Mundubbera Line).—Robert J. Webster, Murgon.

District No. 6 (Dawson Valley Line and Central Line West from Kabra and Branches).—Jos. H. J. Koets, Alma Creek; Harry R. Brake, Don River; Charles G. Young, Wowan.

District No. 7 (North of Gladstone West and from Rockhampton to Malchi on the Central Line, Whole of the Boyne Valley Line).—John E. Harding, Dalma Scrub; Arnot V. Jorgensen, Mount Larcom; George Edw. McDonald, South Yaamba.

"Fruits of Foresight."

We have received an interesting pamphlet issued by Shirley's Fertilisers Proprietary, Limited, entitled ''Fruits of Foresight.'' This pamphlet contains a large amount of very valuable information in a condensed form, and should prove most useful to every man on the land, for, though dealing primarily with the use of fertilisers in the plantation, orchard, and vineyard, it contains much general information of value to all primary producers. The advice tendered is the result of many years of scientific and practical experience, and is therefore well worth the careful consideration of our readers.

"Bunchy Top" in Bananas.

The Minister for Agriculture and Stock (Hon. W. Forgan Smith) has announced that since the discovery of Bunchy Top at Dayboro' on the 30th of December last, the energies of officers of the Fruit Branch of the Department of Agriculture have been concentrated in an effort to locate the extent and check the further spread of this serious banana malady. Approximately 1,000 acres of banana plantations have been inspected to date, and of that area approximately 400 acres, situated in the Rush Creek and Moorina districts, have been found to be more or less seriously affected. Steps have been taken for the eradication of all diseased stools, and failure to carry out the instructions of field officers in this respect will involve delinquent growers in a very heavy penalty. The matter of the distribution of plants from infested plantations has been of great concern. In nearly every case of this nature where it was known that plants had left infested plantations during the period of infestation, the growers concerned have fallen in with the recommendations of Departmental officers, and have removed and destroyed all such plants. It was found that Bunchy Top was little known in the North Coast areas, and instructional work by field officers as to the history, detection, and control of the disease was greatly appreciated by all growers visited.

Entomological Research at Stanthorpe.

The Minister for Agriculture (Hon. W. Forgan Smith), referring to recent Press comment, to the effect that several attempts had been made to induce the Agricultural Department to station a research officer within the Stanthorpe area, but without effect until Mr. Perkins of the University went there, when "peculiar to relate the Agricultural Department also thought it advisable to send an officer to carry out research work there" said that, as a matter of fact, a deputation waited upon him on the 30th January, 1922, when he was acting as Minister for Agriculture. This deputation was from the Southern Queensland Fruitgrowers' Association, and interviewed him on the subject of an appointment of an entomologist to investigate the flruit fly problem in the Stanthorpe district. On the following day Mr. Smith secured the approval of Cabinet of the temporary appointment of Mr. Hubert Jarvis for this purpose, and the final result was that Mr. Jarvis actually assumed duties at Stanthorpe on the 11th February, 1922, or within a fortnight of the deputation's bringing the matter under the Ministerial notice. Mr. Jarvis has been in Stanthorpe ever since, and the Minister is very gratified to observe favourable Press comments on Mr. Jarvis's valuable work.

Four months later (or on the 1st July, 1922) Mr. Perkins, research scholar of the Queensland University, went to Stanthorpe to carry out research work on behalf of the University and the Stanthorpe Fruit Growers' Association. The endowment of the University is accepted as one of the functions of the Government, and the Minister is also accordingly very pleased at the good work that is being done in the Granite Belt by Mr. Perkins.

QUEENSLAND SHOW DATES, 1926.

Killarney: 10th and 11th March.
Milmerran: 31st March.
Sydney Royal: 29th Mar. to 7th April.
Herberton: 5th and 6th April.
Miles: 7th and 8th April.
Pittsworth: 8th April.
Chinchilla: 13th and 14th April.
Kingaroy: 15th and 16th April.
Toowoomba: 20th to 22nd April.
Nanango: 29th and 30th April.
Dalby: 29th and 30th April.
Taroom: 3rd to 5th May.
Oakey: 6th May.
Toogoolawah: 6th and 7th May.
Murgon: 6th and 7th May.
Goombungee: 13th May.
Boonah: 12th and 13th May.
Kilkivan: 12th and 13th May.
Roma: 19th and 20th May.
Wondai: 19th and 20th May.
Ipswich: 19th to 21st May.
Wallumbilla: 25th and 26th May.
Esk: 26th and 27th May.
Maryborough: 25th to 27th May.
Childers: 29th to 31st May and 1st June
Marburg: 2nd and 3rd June.
Bundaberg: 3rd to 5th June.
Gin Gin: 8th to 10th June.
Woombye: 16th and 17th June.
Lowood: 18th and 19th June.
Gatton: 30th June and 1st July.
Kilcoy: 1st and 2nd July.
Laidley: 7th and 8th July.
Biggenden: 1st and 2nd July.
Woodford: 8th and 9th July.
Wellington Point: 10th July.
Maleny: 21st and 22nd July.
Rosewood: 23rd and 24th July.
Royal National: 9th to 14th August.
Crow's Nest: 25th and 26th August.
Coorparoo: 28th August.
Wynnum: 3rd and 4th September.
Zillmere: 11th September.
Rocklea: 25th September.

Answers to Correspondents.

Axle Grease Recipes.

G.C., Kilkivan—

(A) Melt, but avoid boiling, 16 lb. fat, and dissolve in it 2¼ lb. sugar of lead; then add 3 lb. black antimony. The mixture must be constantly stirred until cold.

(B) Fat 2½ lb., camphor 1 oz., blacklead ½ lb. Rub the camphor in a mortar into a paste, with a small portion of the fat; then add the remainder of the fat and blacklead, and thoroughly mix.

Tanning and Unhairing Skins, &c.

G. A. MOORE, Brisbane—

Cut off useless parts of the skin, then soften by soaking it so that all flesh and fat may be scraped from the inside with a blunt knife. Soak the skin then in warm water for an hour, meanwhile mix equal quantities of borax, saltpetre, and Glauber salts with enough water to make a thin paste. About ½ oz. of each ingredient will give enough for an opossum skin and proportionately more will be required for larger ones. When the skin has soaked in warm water lift it and spread it out flat, so that the paste may be applied with a brush to the inside of the skin; more paste will be required where the skin is thick than when it is thin. Double the skin together, flesh side inwards, and place it in a cool place for twenty-four hours, when it should be washed clean, and treated in the same way as before with a mixture of 1 oz. sodium carbonate (washing soda), ½ oz. borax, 2 oz. hard white soap; these must be melted slowly together without being allowed to boil. The skin should then be folded together again, and put in a warm place for twenty-four hours. After this dissolve 4 oz. alum, 8 oz. salt, and 2 oz. sodium bicarbonate (baking soda) in sufficient hot water to saturate the skin; water should be soft, such as rain water. When this is cool enough not to scald the hands, the skin should be immersed, and left for twelve hours; then wring it out, and hang it up to dry. The soaking and drying must be repeated two or three times, till the skin is soft and pliable, after which it may be rubbed with fine sand paper and pumice stone to obtain a smooth finish.

To unhair soak in a fairly strong solution of lime, then push off hair with back of butcher's knife.

Chocolate Making.

C.C.M., Creek street, Brisbane—

To make chocolate, melt cocoa on a hot metal plate until paste is kept in a fluid condition. A proportion of sugar, with sometimes arrowroot, and some flavouring essence, most commonly vanilla, or cinnamon, &c., are added, and when thoroughly incorporated the semi-fluid paste is cast into moulds to cool. The proportions used for the best French chocolate are:—Two beans of vanilla and 1 lb. of best refined sugar to every 3 lb. of best cocoa.

Tanning.

J. GOODWIN, The Caves—see reply to G. A. Moore—

A second method is not so quick but should give better results. Collect some wattle bark and make a strong decoction by boiling or steeping the bark in water. A bushel of crushed bark, from a tannery, will be found an easy way of getting the best bark. The skin should be scraped clean on the inside, as in the lightning process, before steeping begins. It is best to let the skins lie as flat as possible while soaking; and a large square, zinc-lined packing case is therefore preferable to a barrel. The skins should be thoroughly covered by the liquid, which must either be changed once a week or boiled anew and skimmed. While the skin is out of the liquid each week it should be lightly scraped. Large skins take up to six weeks to tan well, but opossum skins will not require more than a month.

The "Queensland Agricultural Journal" is supplied to Queensland farmers free on the prepayment of postage (1s. per annum), and to farmers of other States at 10s. per annum.

Mauritius Beans.

E.J.W.N.—

The bean is not edible, but might be used for fodder if well dried, then chaffed, especially if mixed with bran, chaffed corn, sorghum, or molasses. However, you would be well advised to try cowpeas, which would meet your purpose and would do very well in your district.

Feeding Corn and Cob Meal to Pigs in Dry Times.

J.E.O.B., Kiamba—

The use of the husk and core of maize as a pig food is not specially recommended except it be fed in the early stages of ripening, when they are more succulent and less fibrous. A very much better form of protein and of succulent green stuff is available in lucerne and similar green feeds, and these would be of very much more benefit to the pigs than the dry fibrous husk and core remaining after the grain has been removed. The only advantage there would be in feeding corn and cob meal would be a case of severe shortage of green foods; in this case they would supply bulk and roughage, of which even pigs with their comparatively small stomach must have a certain supply.

The manager of the State Farm at Warren, *viâ* Rockhampton, reports satisfactory results for the feeding of corn and cob meal to both horses, dairy cattle, and pigs, this especially so during dry spells when there is little or no grain food available; at the State Farm, Warren, the corn and cob meal is fed in various forms. They prefer cooking same before feeding it to pigs.

The Instructor in Pig Raising, Mr. Shelton, however, has never specially recommended the grinding of the maize husk and cob, for results of experiments overseas do not appear to justify the extra expense. We have so far had no opportunity of testing this corn and cob meal in comparison with corn meal plus lucerne or other green foods. Either soaking or cooking the meal before use is recommended.

LEAF SPOT.

Replying to a correspondent, Mr. Henry Tryon, Vegetable Pathologist, makes the following observations on some cherry-tree cuttings from a Eukey orchard:—

The cuttings themselves as far as the wood is concerned evince no apparent disease occurring either externally or internally on the tissues.

All the green leaves attached, however, manifest very distinct and well defined more or less circular spots, numbering from two to twenty-three on individual examples. These spots measure from 1 to 3 mm. in diameter and are of a reddish brown colour, and usually occur scattered from the leaf-margin to the midrib more commonly away from the latter and secondary veins. They appear on both leaf-surfaces. When received exhibited no trace of epiphytal fungus; but some of them, under moist conditions, manifested a few very small point-like dark spots in their centres.

These latter point to the cause of the trouble; they being in fact ''acervuli'' (*acervulus*—Lat. for little Heap) of a leaf parasite of deciduous trees (*Clastero sporium caspophilum*), and are composed each of a little mass of fungus hyphæ that have forced their way from the leaf tissue through the cuticle from beneath.

This fungus causes shot-hole effects in other deciduous trees in the Stanthorpe district, but I cannot recall a previous instance of its having come under my notice, as doing so there, so far as the cherry is concerned. In the apple it may occasion some trouble in the bark of the young wood.

I may state that its presence is quite unconnected with Brown Rot disease, that although found associated with fruit, flowers, and shoots does not occur in connection with the foliage.

THE QUALITY OF QUEENSLAND COTTON.

The Minister for Agriculture and Stock (Hon. W. Forgan Smith), in the course of a recent Press announcement, mentioned that his attention had been drawn to a news paragraph in which Mr. G. Evans, the late Director of Cotton Culture in Queensland, had been reported to have stated in his evidence before the Tariff Board in Melbourne that ''for the sake of our reputation we are not going to send our cotton to Liverpool this year.'' It is evident, said Mr. Forgan Smith, that Mr. Evans's statement has been mutilated in transmission, as the quality of the Queensland cotton crop this year promises to be up to a high standard, and it is anticipated that the crop will be disposed of in the Liverpool market as favourably as in former years. The full text of the evidence given by Mr. Evans before the Tariff Board is meanwhile being obtained.

Plate 77. Notable Representation of Queensland's Rural Wealth, New Zealand and South Seas Exhibition, Dunedin, 1925-26.

A view of the Queensland Display on leaving the Canadian Court.

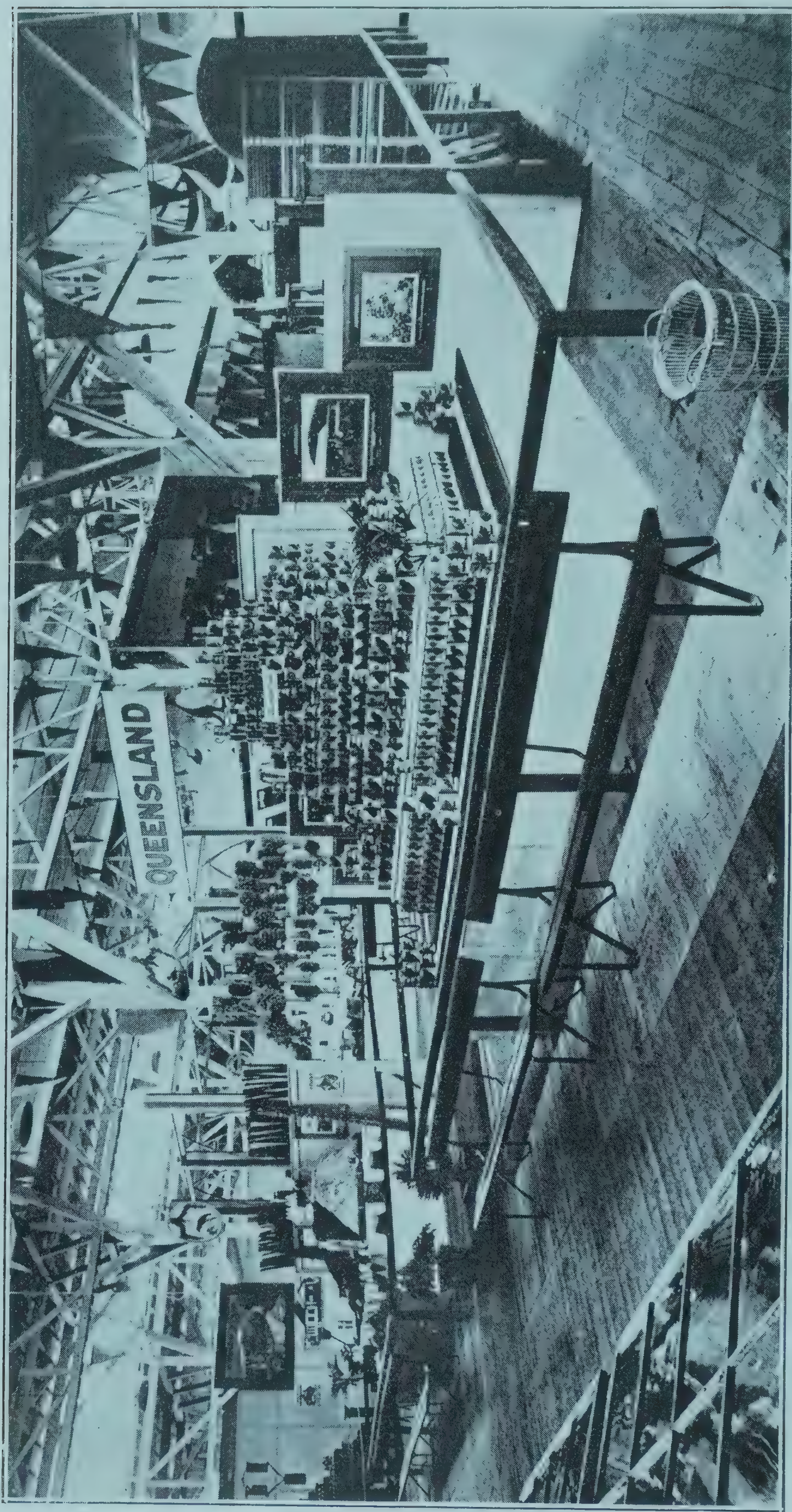


PLATE 78.—THE QUEENSLAND COURT, NEW ZEALAND AND SOUTH SEAS EXHIBITION, DUNEDIN, 1925-26.
General View from one corner, showing from left to right, Tropical Sugar Cane, Agriculture and Dairy Products, State Cannery, and Forestry.

PLATE 79.—QUEENSLAND COURT, NEW ZEALAND AND SOUTH SEAS EXHIBITION, DUNEDIN, 1925-26.
The Forestry Section. The comprehensive Mineral Section is immediately behind.

A NONDRIP PAINT BRUSH.

We like to buy the paint for the kitchen or living room, and put it on ourselves. But when it comes to the ceiling, with the drip of paint down the handle, we wonder if we shouldn't have had it done by some one else.

Here is a way to prevent the flow of paint from running down the handle and on to the hands. Probably there is a small rubber ball about the house that has

FOR PAINTING CEILINGS.

got punctured or lost its buoyancy. Cut this in half with a pair of shears, and then cut a small hole in the bottom of one half.

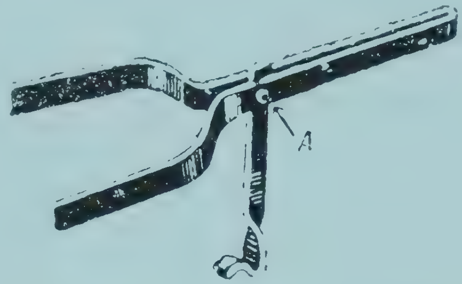
Slip the handle through this in the manner shown in the drawing, and you will have a dripless paint brush.

As the paint collects in the half sphere empty it now and then back into the pail, or let it flow down on to the bristles again.—"Country Gentleman."

WHEN CAN LIDS STICK.

When the cans of milk are being transported from the barn to the dairy house the covers are sometimes pushed down tight to prevent spilling, and it frequently becomes necessary to employ a hammer to loosen them. In this way cans that have been in use only a few months are badly damaged around the top.

To obviate this trouble, and at the same time simplify the work of removing the covers, a farmer has designed a very efficient little tool. A four-foot length of heavy waggon-tire iron is bent, as shown, to form a double-pronged lever with a second piece of the same material at A, which acts as the fulcrum. This is held in place between the two halves of the handle by means of a quarter-inch



THIS PREVENTS DAMAGE TO THE TOPS OF CANS.

bolt or rivet. The prongs of the device are twisted slightly inward at the upper edges, spacing the two just far enough apart so that they will engage the rim of the lid when in position for operation.

In use, the curved foot of the fulcrum piece is placed on one of the handles of the can with the prongs at either side, shown in the illustration.

By pressing down on the lever handle the lid of the can is raised quickly, and with little effort. This idea will no doubt appeal to many dairymen who have acquired skinned knuckles or bruised fingers in attempts to remove can lids that stick.—"Country Gentleman."

Farm and Garden Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April:—Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

In those areas where seasonable rainfall permitted the planting of potatoes, these should now be showing good growth and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and, where necessary, thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—*i.e.*, those which require a fairly long period to develop in, every effort should be made to bring the seedbed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally, except cucumbers, marrows, and pumpkins. In connection with these crops, growers are recommended to adopt some form of seed selection for the purpose of improving the quality of vegetables grown by them. Just at present, selections should be made from all members of the cucurbitaceæ (pumpkins, cucumbers, &c.). Tomatoes should also be selected for seed. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

Orchard Notes for April.

THE COASTAL DISTRICTS.

In the Orchard Notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus, and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus becomes toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predacous insects to get at and destroy the pupæ of fruitflies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly cleared land time to sweeten before planting.

Strawberries can still be planted, and the earlier plantings must be kept well worked and free from all weeds in order to get a good crop of early fruit.

Scrub land intended for bananas can be felled now, as there will be little more growth, and it will have ample time to dry off properly in time for an early spring burn. Do not rush scrub falling, as it is work that pays for extra care. Lopping will improve prospects of a successful fire.

Keep a keen lookout for fruit flies, and on no account allow any fallen fruit of any kind to lie about on the ground unless you are looking for trouble with the ripening citrus crop. Keep the fly in check, and there will not be any very serious losses; neglect it, and there will not be much fruit to market.

The advice given with respect to the handling and marketing of citrus fruit applies equally to custard apples, pineapples, bananas, and other fruits. In the case of bananas handled by the Committee of Direction of Fruit Marketing, grading is now compulsory, and it will undoubtedly tend to stabilise the market for this fruit.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Practically the whole of the fruit crop will have been gathered by the end of March, but several of the later-ripening varieties of apples grown in the Granite Belt may be kept for a considerable time, provided they are free from fly or other pests and are stored under proper conditions. Varieties such as Jonathan can be kept for some months at a temperature of 31 to 32 deg., and later varieties, such as Granny Smith and Sturmer can be kept till apples come again if stored at the same temperature. At the same time, although storing the fruit at this temperature under artificial conditions enables them to be kept for many months, the fruit can be kept for a considerable period, and marketed from time to time as desired, by storing it in a specially constructed apple-house in or adjacent to the orchard where grown.

Such a store can be cheaply constructed in the side of a hill out of the soil of the district and slabs of timber. The soil will make excellent pisé for walls, and the roof may be constructed of slabs covered with soil. Such a store can be kept at a very even temperature, and if the air is changed during cool nights—not frosty nights—the temperature can be reduced to a low point—low enough to keep the fruit in good condition for many weeks.

All orchards and vineyards not already cleaned up must be put in order, and all weeds destroyed. Keep the surface of the soil stirred so as to give birds and insects a chance to get at any fruit fly pupæ, as it is necessary to destroy this pest whenever there is a chance of doing so.

Land intended for planting during the coming season should be got ready in order to expose the soil to the cold of winter, thus rendering is sweeter and more friable.

If there is any slack time in the course of the month, go over all surface and cut-off drains and put them in good order. Also, if during periods of heavy rain, soft or boggy spots have made their appearance in the orchard, do what draining is necessary, as badly drained land is not profitable orchard land, and the sooner it is drained the better for the trees growing upon it. Soft or boggy spots are frequently caused by seepage of water from a higher level. In this case a cut-off drain will be all that is necessary, but where the bad drainage is due to hard pan or an impervious subsoil, then underground drains must be put in. After draining, the land should be limed. Liming can be done now and during the following three months, as autumn and winter are the best times to apply this material.

When the orchard soil is deficient in organic matter (humus) and nitrogen, try the effect of green-crop manuring, planting the grey or partridge pea and manuring the ground for this crop with a good dressing of finely ground island phosphate or basic phosphate.

Where citrus fruits are grown, they should now be ready for marketing. If the land needs it, it should be given an irrigation, but unless the trees are suffering from want of water it is better to stick to the use of the cultivator, as too much water injures the keeping and carrying qualities of the fruit.

The remarks on the handling and packing of citrus fruits in the coast districts apply to the inland districts also, but these districts have an advantage over the coast in that, owing to the drier atmosphere, the skin of the fruit is tougher and thinner and in consequence the fruit carries better.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. K. CHAPMAN.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1926.	March.		April.		Moonrise. Mar.	Moonrise. April.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5·46	6·24	6·3	5·50	p.m. 7·28	p.m. 7·48
2	5·47	6·23	6·4	5·49	8·1	8·28
3	5·48	6·22	6·4	5·48	8·35	9·12
4	5·48	6·21	6·5	5·47	9·10	10·2
5	5·49	6·20	6·6	5·45	9·48	10·56
6	5·49	6·19	6·6	5·44	10·30	11·58
7	5·50	6·17	6·7	5·43	11·13	nil
8	5·50	6·16	6·7	5·42	nil	a.m. 1·1
9	5·51	6·15	6·8	5·41	a.m. 12·7	2·5
10	5·51	6·14	6·8	5·40	1·7	3·5
11	5·52	6·13	6·9	5·39	2·9	4·16
12	5·52	6·12	6·9	5·38	3·16	5·22
13	5·53	6·11	6·10	5·37	4·25	6·25
14	5·54	6 10	6·10	5·36	5·32	7·28
15	5·55	6·9	6·11	5·35	6·38	8·30
16	5·55	6·7	6·11	5 34	7·42	9·30
17	5·56	6·6	6·12	5·33	8·45	10·28
18	5·57	6·5	6·12	5·32	9·46	11·22
19	5·57	6·4	6·13	5·31	10·46	p.m. 12·13
20	5·58	6·3	6·13	5·30	11·43	12·59
21	5·58	6·2	6·14	5·29	p.m. 12·38	1·41
22	5·59	6·0	6·14	5·28	1·31	2·20
23	5·59	5·59	6·15	5·27	2·18	2·56
24	6·0	5·58	6·15	5·26	3·3	3·29
25	6·0	5·57	6·16	5·25	3·42	4·3
26	6·1	5·56	6·16	5·24	4·21	4·37
27	6·1	5·55	6·17	5·23	4·56	5·10
28	6·2	5·53	6·17	5·22	5·30	5·46
29	6·2	5·52	5·18	5·22	6·2	6·25
30	6·3	5·51	5·18	5·21	6·39	7·9
31	6·3	5·50	...	...	7·11	...

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

7 Mar.	☾	Last Quarter	9 49 p.m.
14 ,,	●	New Moon	1 20 p.m.
21 ,,	☽	First Quarter	3 12 p.m.
29 ,,	○	Full Moon	8 0 p.m.

Perigee, 13th March, at 9 30 a.m.
Apogee, 25th March, at 2 54 p.m.

During the first half of the month there will be no planet visible before 9 p.m. Although Neptune will be above the horizon, it will not be visible to the naked eye. The planets Saturn, Mars, Jupiter, and Venus, being on the west side of the sun, will rise before it at the following times near the middle of the month. Saturn, about 9·17 p.m.; Mars, about 1·10 a.m.; Jupiter and Venus, about 3 a.m. Mercury will be at its greatest elongation, 18 degrees 23 minutes east, on the 14th, and should be noticeable, low down in the west, about half-an-hour after sunset. The brilliancy of Venus, high up in the east before sunrise, will be remarkable about this time of the month.

6 April	☾	Last Quarter	6 50 a.m.
13 ,,	●	New Moon	12 56 a.m.
20 ,,	☽	First Quarter	9 23 a.m.
28 ,,	○	Full Moon	10 17 a.m.

Perigee, 10th April, at 12 42 p.m.
Apogee, 22nd April, at 8 48 a.m.

On April the 8th, between 2 and 3 a.m., an interesting occultation of the planet Mars will take place well up in the eastern sky. A pair of binoculars or small telescope will afford a pleasing spectacle in watching the approach of the Moon toward the planet about 2 a.m., and its disappearance behind the Moon a quarter of an hour or twenty minutes later; the reappearance of the planet may be watched for about 3 a.m. on the opposite or upper side of the Moon.

Jupiter will be in conjunction with the Moon on the 9th at 11·22 a.m., but being at a distance of nearly 5 degrees from it, and not far enough away from the sun, it will not form a good daylight spectacle even in a pair of binoculars or small telescope. On the 19th Venus will be at its greatest distance from the Sun 46 degrees 16 minutes to the west of it and will therefore rise 2½ hours before the Sun and set about 2 hours 10 minutes before it. On the 23rd Mars and Jupiter will be in conjunction, Mars being uppermost and about 1 degree or about two diameters of the Moon above Jupiter. On the 28th Mercury will be at its greatest distance 27 degrees and four minutes west of the Sun, Mercury will therefore rise 2 hours 3 minutes before the Sun, and set 1 hour 11 minutes before it.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

A scheme for standardising varieties of wheat grown in Queensland and for the propagation, grading, cleaning, and distribution of seed wheat is discussed by Mr. Quodling in this issue. Mr. Cottrell-Dormer has some interesting illustrated notes and observations on the red streak associated with Queensland Top Rot disease in cane. Mr. Edmund Jarvis, who has been in the South on a long and well-earned holiday, and whose contributions to these pages are so well appreciated, has resumed his series of seasonable hints to canegrowers. Inquiries on entomological subjects will welcome Mr. Veitch's suggestions concerning forms of inquiry and the sending of specimens for identification. Mr. Verney supplies some timely notes on milk veins and wells; also the care and handling of cream. Some factors that determine the keeping quality of stored maize are discussed by Mr. Coleman. Mr. Shelton continues his series on sty and paddock accommodation for pigs, and adds some informative notes on the Berkshire. Marketing table poultry is Mr. Rumball's subject this month. Of particular interest to dwellers in forest areas is a descriptive article on the naming of Queensland timber, together with a complete schedule showing botanical identity, and official and local vernacular names of woods, supplied by Mr. Swain. Two interesting plants from North Queensland, illustrated by very fine drawings, the work of Mr. Helmsing, are described briefly by Mr. White and Mr. Francis.

The Department and the Farmer.

The organisation and work of the Agricultural and Stock Department were reviewed by the Under Secretary, Mr. E. Graham, in the course of a radio talk to farmers which was broadcasted from 4QG recently. Mr. Graham pointed out that

departmental success was the result of a broad-visioned policy, allied with administration in sympathy with its peculiar needs, woven inextricably with the fortunes of the agricultural industry. The basic elements of agriculture were land, sunshine, water. Two of those elements Queensland possessed in abundance, and in the provision of the third, where the need existed the full resources of science, were being invoked by far-seeing leaders in the movement for rural improvement. The resources of science, directed by common-sense administration, were also being invoked in the solution of our rural problems—problems that were met with daily in departmental life. Since 1859, when Queensland attained self-government, the development of agriculture had been steady and consistent. From those first beginnings at New Farm, Breakfast Creek, Eagle Farm, and Coorparoo, now embraced in Brisbane suburbs, had grown the great industry as we knew it to-day. At the end of the last census period (1921) 16,249,600 acres in Queensland were peopled by prosperous farmers and dairymen. From the day when Patrick Leslie drove in his tent pegs on the Darling Downs the vast resources of the State had been gradually unfolded. The progress generated by the efforts of a small population had been phenomenal, and it is doubtful if any other country in the world could show the same record.

Anzac.

25th April, Anzac Day, is one of the greatest dates in Australian history, and its reverent commemoration was general throughout the Commonwealth. The men who gave Australia liberty to continue her free development, her place among the nations, and a resplendent example that has already become a great tradition, were not forgotten. In 1914 Australia called for her best; she is calling for her best to-day, and in the work of nation building the best, animated by the spirit of Anzac, will not be denied her.

On the Air.

Radio talks to farmers are becoming a popular feature of the broadcasting programmes of the State Wireless Station. The present series was begun on the occasion of the commencement of operations with the new and powerful plant with an address by the Minister for Agriculture and Stock (Hon. W. Forgan Smith), in the course of which he reviewed the work of the Council of Agriculture, of which he is president, and Queensland agricultural organisation generally. Improvement in production followed, Mr. Smith pointed out, when science guided the way and a similar improvement would result naturally from the application of science to marketing methods. The Government had initiated a sound scheme, had seen it through its teething period, financed it in its early stages, and clothed it with the requisite legislative and executive authority. The provision of food, clothing, and shelter were the immediate material needs of the people, and in the scheme for organising the affairs of the rural producer the interests of the consumer had not been disregarded. The aid was to bring both sections closer together and reduce the economic waste that is the natural corollary to haphazard and disorderly marketing. The main objects of the Council of Agriculture were to extend co-operative marketing of farmers' produce, to encourage the development of the business side of farming to the highest point of efficiency, and create in the mind of the city dweller a truer conception of the farmer's relationship to other units in the social and economic structure. The problem of how to make farming show a reasonable return was, as was quite evident, a national one. In Australia, by general agreement, we protected the secondary industries to ensure reasonable returns and satisfactory progress in those industries. The claim of primary producers to a simalar measure of protection was, on the face of it, just and equitable. Australia called persistently and insistently for a positive policy in every industry and activity. The Australian people were, on their record, quite equal to the task of industrial reorganisation and reconstruction, primary and secondary, on the basis of fairness, soundness, and sanity, and the road to the desired goal was beaconed by co-operation and education. Ignorance cost more than anything else in the world. Education was the one thing for which no nation ever paid too much. To education was to co-operate. The Government had been quick to realise the value of radio as a great social force, and to recognise that no single invention in this age of wonders touched so closely human interest and human welfare.

The Corriedale.

Over 10,000 sheep in Queensland are described as Corriedales on stock returns, and only one flock out of the total is registered by the Corriedale Stud Book. Interest in the breed as a dual purpose sheep is increasing, and too much care cannot be taken in maintaining stud book standards. As to what a Corriedale should be, we are indebted to Mr. J. H. Fairfax, of Marinya, Cambooya, for the following definition:—

(*a*) The foundation stock must be Lincolns and Merinos.

(*b*) The sheep shall be inbred half-breds for at least twenty years.

(*c*) In the event of a breeder starting his flock with pure Corriedales on one side, it would only be necessary for the progeny from the half-bred Lincoln-Merino ewes or rams to be subsequently inbred for fifteen years.

(*d*) Any breeder whose flock has been bred up on both sides from Corriedale flocks fully registered in the New Zealand Sheepbreeders' Association's Flock Book shall be eligible for registration, provided only that such flocks shall have been inbred for a period of at least twenty years.

The Interdependence of Primary and Secondary Industry.

The grouping of our industries as primary and secondary is becoming to be regarded as quite illogical. All industries are interdependent and complementary, and this point was discussed fully at a recent meeting of manufacturers in the South. The views put forward on that occasion are worthy of more than passing notice. It was argued that when we look at the matter closely we see that civilised society would be impossible but for the division of labour. Machine methods and the wonderful inventions of modern times, it was held, have not only increased enormously the productivity of man, but they have so widened his horizon and multiplied his wants as to greatly increase the divisions into which the labour of the community is drafted. Every individual is able to devote his life to the occupation to which choice, chance, or circumstance has called him, only because others are engaged in producing the other things he needs to sustain life and give it colour and movement. Men are able to devote the whole of their time to the growth of wheat, for example, because and only because, other men manufacture machinery, drive trains and lorries, grind wheat into flour, make and deliver bread, and do the hundred and one other things necessary to make possible that measure of comfort modern man demands. And no one of these, it was further argued, is entitled to regard his labour as more necessary than that of his fellows. "The man who is engaged in growing wheat is no more necessary to the production of the loaf on our table than the man who baked it, or the man who built the oven in which it was baked, or the man who built or drove the cart which brought it to our door. In order that the farmer may grow wheat he must have machinery made for him by the despised manufacturer in what is called 'secondary industry.' The production of wheat on the farm is only one stage in a long and complex process which ends in the delivery of bread to the consumer in Australia or on the other side of the world." (We quote from a speech by Mr. W. M. Hughes, former Prime Minister, on the occasion referred to.) It was further held that the man on the land is able to devote himself to producing wheat or wool or butter or fruit, because other men make agricultural or sheep-shearing machinery, wool presses, churns, build factories, drive trains or lorries, and sail ships, to say nothing of making clothes, boots, and the many other things that modern man, whether on the land or in other industries, desires and considers necessary. One manufacturer put it this way: "Which is the primary industry, that of the man who grows the wheat, or that of the man who makes the machinery with which he ploughs, harrows, and garners the wheat?" It was further held that to say that the men who build the separator and the churn are engaged in secondary industries, while the men who use them are primary producers, is to wrest words from their obvious meaning. One is tempted to pursue the interesting conclusions of the speakers at that particular function further, but it is plain to all, looking at the subject from any point of view, that all services are essential, that they depend one upon the other, and national progress depends just as much on urban as on rural industry. A nation must have two legs to stand on—"primary" and "secondary" industry—and in regard to each, Australia must aim to go right ahead to the limit of her resources.

Bureau of Sugar Experiment Stations.

NOTES AND OBSERVATIONS ON THE RED STREAK ASSOCIATED WITH QUEENSLAND TOP ROT DISEASE.

By W. COTTRELL-DORMER.

Introduction.

The experiments and observations outlined below were carried out with a view to inquiring into the nature of certain bright Red Streaks which appear in cane leaves, especially Badila (N.G. 15), at about this time of the year. The whole of the inquiry was carried out during the very short period of three weeks—15th December, 1925, to 6th January, 1926—so that the work had to be done in a more or less hurried fashion, and it is only because it is probable that a considerable period of time must elapse before the present writer can again take up the work that these preliminary notes are being published.

PLATE 119 (Fig. 1).

During the course of this paper the words Red Streak, written with capital letters, refer definitely to the Red Streaks under investigation, and only to such, while red streak written without capitals is to be considered as a collective term referring to any of the many different types of red streaks which accompany cane ailments.

The writer wishes to thank the Rev. N. Michael, who, by giving the use of a room, stove, cupboards, &c., greatly facilitated the execution of the microscope work and culture work necessitated by this inquiry, and Mr. D. S. North, pathologist to the Colonial Sugar Refining Company, Limited, for valuable suggestions.

To Mr. H. Ritchie, of Kilrie Farm, and to his neighbour, Mr. J. Soper, junr., many thanks are also due for permission to carry out the inoculation experiments in their canefields.

Description of Red Streak Infection.

The first visible indication of Red Streak infection in a cane top is the presence at the base of one or more leaf blades, usually on the half unfurled or first unfurled leaf, of a narrow, dark watery green, longitudinal streak about 1 in. to $1\frac{1}{2}$ in. in length and $\frac{1}{16}$ in. in width. This streak grows very quickly, and as it grows alters in

colour, gradually changing from watery green to watery brown and then to bright blood red. Fresh streaks are meanwhile formed on the same and younger leaves, and unless some climatic or other factor which is not yet understood intervenes the infection apparently progresses until all of the younger leaves are blazoned with brilliant red lines, which will sometimes coalesce if two or more streaks be close together, forming bands often ½ in. or more in width and 2 ft. or 3 ft. in length. (See Fig. 1.) On the other hand, the infection will sometimes cease to be active after one thin streak, perhaps no more than 1 in. in length, has been formed.

Red Streaks are able to form in any portion of the leaf (see Fig. 2), though it is the general rule for them to take their source at or near the base of the blade; they are often found on the under side of the mid-rib, and these are the ones that usually attain the greatest length.

When the Red Streaks become old the tissue which originally formed them will sometimes die and wither, and assume a chocolate-brown colour.

Plate 120 (Fig. 2 and 3).

A very noticeable feature of the most active Red Streaks is that they are almost invariably splashed here and there along their whole length by brown or white stains which appear to be the result of the drying of some exudation formed during their growth, though no wounds of any kind are visible at these places, unless the leaf tissue has broken down completely, as sometimes does happen.

Observations on Growth of Red Streak.

With a view to observing the growth of Red Streaks three stems were selected, marked, and examined from time to time. Observations were commenced at 12 noon on 19th December, when stem

A had one sharp narrow Red Streak 6 in. long, and commencing about 1½ in. from leaf-sheath juncture on third fully unfurled leaf.

B had one $2\frac{1}{2}$ in. streak of a watery green colour tinged here and there with pink on half unfurled leaf.

C, which was part of a badly Red Streak infected stool, one stalk having already been killed by Top Rot, was marked by one streak 9 in. long, bright red, and starting from near leaf-sheath juncture.

21st December—

A Streak unaltered.

B Streak was now 12 in. long, bright red at base, and very dark watery green to watery brown spotted with red on upper half, and had a vague yellowish tip and background.

C Original streak unaltered. Four fresh streaks about 2 in. in length had formed immediately adjacent to the older streak and with their bases at the leaf-sheath juncture; their colour varied from bright red to watery brown.

23rd December—

A No alteration.

B Original streak now 18 in. long and all dark red, with withered portions in upper part. Fresh watery green to brown streak 4 in. long now present immediately to right of above. The second leaf above the originally infected leaf—i.e., what was now the first fully unfurled leaf—now showed a patch about 1 in. long by $\frac{1}{3}$ in. wide about $\frac{1}{2}$ in. above the leaf-sheath juncture. Central portion of this patch was of a light brown colour, while edges were a light pink. This patch apparently represented a severe local infection.

C Streaks all dark red, otherwise no alteration.

26th December—

A No alteration.

B A fresh young streak about 2 in. long was now forming on leaf situated between two leaves already infected, while the patch referred to above had become part of a wide vigorous looking streak 4 in. in length.

C No alteration.

4th January—

A No alteration.

B Position of infected leaves was now 3rd, 4th, and 5th, fully unfurled. Streaks on 5th (original infected leaf) had coalesced to form a large dark Red Streak 18 in. long, with dead central tissue in places. Streak on 4th was now about 8 inches long and all dark red. Third leaf was still showing signs of activity, as two watery brown streaks each about 2 in. long were forming at base of leaf. Most of patch noticed on this leaf on 23rd December was now quite dead and largely disrupted, while the streak emanating therefrom was now some 10 in. long and marked every here and there by a brown or white "exudation stain."

C No alteration.

Distribution of Red Streaks in a Field.

Some counts were taken in the field where the above observations were made of three rows, each ten rows apart, in the worst infected end of the field. Thus—

Row.	Total Number Stools.	Percentage of Diseased Stools.	Total Number Stems in Diseased Stools.	Percentage of Diseased Stems.
1	191	30·0	270	38
2	287	19·5	302	43
3	290	5·5	89	21

Further counts taken a week later showed but very slight increase in the incidence of the Red Streaks, though, judging by appearances, the number of Red Streaks had increased very much.

Though single infected stools were met with here and there, it was very noticeable that most of the diseased stools in each row were confined to four or five well-defined centres of infection.

Most of the infected stools were situated in the north-eastern corner of this field, where the cane was showing the best and most vigorous growth.

However, Red Streaks are not necessarily always confined to the most vigorous cane, or even to young plant cane. The writer has seen a field of young plant Badila at Stratford, near Cairns, very seriously infected with Red Streaks, though the cane was very backward indeed, and growing on badly-drained, sour-smelling land. On the Burdekin River Red Streaks were observed on this visit on the leaves of fully-matured Badila, while on the Herbert River late in November Red Streaks were seen on young ratoon shoots 18 in. high of Badila and Q. 813. Vigorous young plant Badila, however, is the cane usually attacked.

Relationship of Red Streaks to Top Rot Disease.

A field which is well infected with Red Streaks usually gives off a strong smell of decaying fruit, and upon close examination it is seen that every here and there a stalk whose top is literally covered in Red Streaks has a dead "heart," which may be easily pulled out (see Fig. 1), its lower end being quite rotted, and which has an offensive

Plate 121 (Fig. 4).

odour. On the other hand, some tops are found whose hearts are dead but whose leaves are not marked by Red Streaks; however, when the heart is pulled out it is found that some of the very young leaves, now dead, are marked, at a region usually about their middle, by a peculiar streaky discoloured area distinctive in the very irregularity of its form; such areas do not generally cover more than about 3 square inches, usually much less. Both of these conditions constitute what is known as Top Rot.

During this inquiry it was observed that fully 90 per cent. of the stalks whose hearts had been killed by Top Rot had one or more leaves marked by one or more Red Streaks.

Questioned on the matter of relationship of Red Streaks to Top Rot, some twenty farmers were adamant in the expressed opinion that Red Streaks were the early stage of Top Rot, and that fields which later suffered heavily from Top Rot always showed a heavy infestation of Red Streaks before the real damage was done, though the fact that Red Streaks were present did not always signify that Top Rot would be severe later on—i.e., that cane often appeared to be able to recover from a severe visitation of Red Streaks and show but very little loss from Top Rot.

H. Tryon (1), in his paper on Top Rot Disease, refers to Red Streaks in four places (pp. 8, 22, and 41), and in one place at least (p. 22), where one grower is quoted as having remarked:—"Yes, I was amongst this cane with Red Streaks in its leaves five weeks since, and was then able by the odour that it emitted to recognise the presence of Top Rot." It seems that the Red Streaks described above are being referred to.

More recently the writer (2) has referred to Red Streaks as being the early stage of Top Rot, basing his opinions on field observations.

That there is some intimate relationship between Red Streaks and Top Rot is obvious since the former seem to invariably precede and accompany the latter in the field, though not necessarily in the stalk.

Similar Diseases in Other Countries.

In Hawaii a disease occurs which is known as Bacterial Red Stripe Disease, and bears many characteristics similar to those of Top Rot as it is known in Queensland. H. Atherton Lee and W. C. Jennings (3) state that this disease "is easily identified by the long, narrow, dark red, longitudinal streaks on the cane leaves. These streaks usually start midway between the tip of the leaf and its juncture with the leaf sheath, at the point where the bend in the leaves of Tip Canes takes place. The first indication of the disease is a watery darkened streak, not yet red, but still green, which spreads longitudinally up and down the leaf. This watery, dark green streak gradually becomes bright red in colour."

Polvillo is a bacterial disease which occurs in Tucuman, Argentine, and has been carefully studied by G. L. Fawcett (4). The description of this disease very much resembles that of Top Rot. As in the case of the latter disease red stripes and dead hearts are produced. Plant cane chiefly is attacked.

D. S. North (5) points out the similarity between Top Rot, Red Stripe, and Polvillo, in the following words:—"Conspicuous red streaks are the most characteristic symptoms with all three diseases. Those of Red Stripe usually start about the middle of the leaf blade, and are long, whereas those of Top Rot are shorter, and are usually confined to the base of the leaf blade, although in other respects much the same. Reddening of the leaf-sheath occurs regularly with both Polvillo (the Argentine disease) and Top Rot, but only in severe cases with Red Stripe. All three cause a Top Rot in severe cases. Cuttings from diseased stalks do not usually produce diseased plants. When Top Rot occurs side shoots of healthy appearance may sprout from below the rotten portion and grow without further sign of the disease." Referring to Red Stripe disease the same author goes on to say that—"In these and all other respects the resemblance is so striking that we may now suspect our Top Rot to be due to a similar cause, viz., bacteria, which are probably disseminated by the wind and flying insects, and which need rainy weather in order to infect the leaves. Frequently the disease is confined to the leaves thus affected, and disappears when these leaves wither, unless younger leaves become similarly infected in the meantime. Even in severe cases where Top Rot results from the invasion of the apical bud and top generally, the disease runs a rapid course and disappears with a change to weather conditions unfavourable to it, leaving the top dead but the rest of the stalk free from infection."

It was especial consideration of the paper just quoted which led the writer to investigate the matter in the field on this occasion.

Before going further the writer would like to mention that in his experience the leaf-sheaths of Red Streak infected cane have not become reddened under field conditions except in fairly severe cases.

Were Red Streaks and Top Rot proved to be infectious bacterial diseases, a moment's consideration would show us what ideal conditions obtain at the season of Red Streak appearance for the transmission and incubation of the responsible organism. The water of transpiration always present on cane tops during the season when the disease is prevalent provides a suitable channel of infection and incubation if such are needed, and, again, the under side of the base of the blades of young cane leaves is the favourite feeding ground of certain sap-sucking Homoptera, such as *Perkinsiella saccharicida*, which also makes large punctures in the mid-rib when laying its eggs.

Bacteria Found in Red Streaks Associated with Queensland Top Rot.

Late in November last the writer examined Red Streaks from young ratoon Badila and Q. 813 at Macnade, Herbert River, and found many active bacteria in all of them, but especially in those streaks which had reached about the half-way stage in the transition from watery green to red.

Red Streaks examined by the writer at Ayr on 16th December were similarly found to contain many active bacteria.

Reproduction of Red Streaks by Artificial Inoculation.

SERIES I.

16th December.—A typical young streak, i.e., one transforming from watery green to red, was suitably cleaned and a portion crushed up in sterilised water. The suspension so formed was used for inoculating sterilised potato slices. In twenty-four to thirty hours a thick, viscid, creamy yellow growth had formed. Lack of bacteriological equipment prevented the preparation of cultures aiming at the isolation of the organism in pure culture.

PLATE 122 (Fig. 5).

19th December.—After three days' growth on a potato slice a suspension of the bacteria was made in sterilised water and used for inoculating the leaves of fifteen stalks of Badila (N.G. 15) in a field of vigorously growing eight months old irrigated plant cane showing no definite Red Streaks. The suspension contained actively motile bacteria of similar appearance to those seen in Red Streaks previously.

The methods of inoculation included inoculation with and without punctures and with a protective covering, inoculations a few inches up one or two leaves of individual stalks, and inoculation at the base of the heart. Punctures were made with a sterilised pricker, and covering was effected by placing a little damp cotton wool on each side of inoculated region and wrapping the two or more inoculated leaves and those adjoining with thin waxed paper.

Development of Red Streaks in Inoculated Leaves.

Within seven days 100 per cent. of punctured leaves and 75 per cent., i.e., 3, of stalks inoculated without wounding showed positive infection of Red Streaks.

All wrappings were removed on the second day, when it was found that in most cases the cotton wool was still damp. A short, watery green streak had now formed near the base of a half-unfurled leaf on one stalk, while in most other cases it was observed that the punctures, where visible, were surrounded by a light red margin.

On the fourth day nine stems, including one which had been inoculated by simply placing a drop of suspension on the under side of the half-unfurled leaf and on the upper side of the leaf immediately below it, and two in which inoculation had consisted of pouring a little suspension on to the base of the heart, showed one or more watery green to light yellow streaks on their leaves. Even where the needle had been used it was observed that not all of these streaks arose from punctures, as in some cases streaks had developed in regions of the leaf unwounded throughout their length. Many of the older streaks, i.e., those streaks which were already approaching a red colour, were marked by one or more of the ''exudation stains'' described earlier. Five other stems were now developing watery green streaks about punctures.

On the fifth day three stems showed positive infection with Red Streaks. In all cases the infection was developing rapidly. Fresh ''exudation stains'' were seen to have formed.

On the sixteenth day it was found that the infection had been so vigorous that many leaves bore Red Streaks 1 ft. to 3 ft. in length, and in some cases fresh watery green streaks were still forming on the green leaves of heart. In few cases had the infection travelled below the leaf-sheath junctures.

SERIES II.

19th December.—The leaves of eight stalks near those treated in Series I. were similarly inoculated as controls, using as inoculum a brick-red bacterial colony which had developed on a control potato slice through contamination.

Red Streaks were sparsely produced on five of these stalks, however, being possibly attributable to a carry-over of bacteria from the earlier inoculations in spite of the aseptic precautions taken.

SERIES III.

This series of inoculations was carried out at the least infected end of the field where the infection counts mentioned earlier were taken in well-watered, vigorously growing, eight months old Badila. Very few stalks showed Red Streaks in the vicinity of those inoculated.

21st December.—Ten stalks were inoculated direct from infected leaves taken from the field itself by drawing a needle through a vigorous watery brown streak and then scratching the half-unfurled leaf and that immediately below it at about 4 in. from the leaf-sheath junctures.

Twenty stalks were inoculated as in Series I., using a pricker and a suspension made from a five days old culture.

Of these thirty stalks 100 per cent. developed positive Red Streak infection, the most vigorous infection being obtained where the base of the young leaves of the heart had been inoculated with the suspension and the least vigorous where Red Streaks themselves had been used as inoculum, which possibly may be explained by the comparatively dry nature of the latter.

SERIES IV.

As it was desirable to find out what effect the bacteria would have on the immature tissues of the cane top, a hypodermic syringe fitted with new needle and washers was employed in this series of inoculations. Previous to using for this purpose the syringe had been employed by a dentist for cocaine injections. The syringe was now washed out with methylated spirit and then with distilled water, this being again done after this series of inoculations was completed.

23rd December.—Fresh suspensions of bacteria were made up from seven days old cultures, which were now old and evil-smelling.

Charges of from ·5 c.c. to 1·5 c.c. of suspension were forced into various parts of the cane tops, from the uppermost ligule down to the semi-mature cane stem.

This series of inoculations produced no effect whatever on leaves, heart, leaf-sheaths, or stem. It was therefore concluded that either the syringe still contained fragments of some powerful sterilising agent after washing, or the cultures had become sterile through the action of their own excretions, which is the more likely explanation since the syringe was so often emptied and refilled. Microscopic examination of the suspension used had, through an oversight, been omitted.

Reproduction of Top Rot Symptoms by Artificial Inoculation.

Series V.

29th December.—As soon as it was seen that Series IV. had failed to produce any infections, fresh potato-slice cultures were prepared from a vigorous young streak taken from an infected stem in Series I., one control slice being also prepared. Whereas the latter remained free from bacterial growth throughout the period of observation, the former already showed slight viscid, creamy yellow growth after ten hours, and in thirty-six hours sufficient bacterial matter was available for further inoculations; a suspension of this matter was accordingly made in sterilised water, and was found to contain many actively motile bacteria similar in appearance to those previously observed.

30th December.—Twelve stalks in the field mentioned under Series I. were each injected with 1·5 c.c. of the fresh suspension. These inoculations were divided into three groups as follows:—(*a*) Suspension injected 1 in. below uppermost ligule; (*b*) suspension injected 3 in. below uppermost ligule; (*c*) suspension injected 6 in. below uppermost ligule. This grouping really includes quite a variety of inoculation points since some stems were unavoidably further advanced than others.

Plate 123 (Fig. 6).

The leaves of ten other stalks were inoculated as in Series I. In four of these inoculations the suspension was first passed through the hypodermic syringe. The leaves of six of the stalks in this group were punctured at time of inoculation, while the remainder were inoculated without wounding.

6th January—

Group (*a*). All showed definite Red Streak infection, many young streaks developing. In one case long light pink and watery marks showed that the infection was descending one young internal white leaf and approaching the growing point of the cane stem.

Groups (*b*) and (*c*).—In these stalks all of the internal and some of the external symptoms of Top Rot were produced. The actual symptoms produced in any individual stalk appeared to depend upon the point of injection. Thus where the heart had been inoculated near the growing point of stem the central heart leaves had rotted through; where the growing point itself had received the injection, or part of it, the usual deformities of nodes and internodes (produced since time of inoculation), the reddening of vascular bundles, and reddening and decay of leaf-sheath bases and adjoining stem tissues attendant on a severe attack of Top Rot, were produced; in all cases, regardless of where the suspension had been injected, a most virulent infection which gave off a typical Top Rot odour resulted, and one or more other minor Top Rot symptoms appeared. Unfortunately, the writer was not able to continue his inquiries further, but since the infections all appeared to be so vigorous on this last day of examination it seemed most probable that death of the heart and growing point, and possibly of the stem itself, would have been the final result of the inoculations. No Red Streaks appeared on the leaves of any of the stalks of these two groups.

Summary of Inoculation Results.

The inoculation experiments described above have shown—

1. That the formation of Red Streaks can be induced in cane leaves by pricking or scratching the epidermis of either side of the leaf near the base of the blade with a needle which has been drawn through an active Red Streak on a naturally infected leaf.

2. That the formation of Red Streaks can be induced in cane leaves by inoculation of the leaves at or near their base with a watery suspension of bacteria taken from a potato-slice culture of the bacteria found in the natural Red Streaks of the field.

3. That the formation of Red Streaks can again be induced by the inoculation of cane leaves with a watery suspension of bacteria taken from a potato-slice culture of the bacteria found in Red Streaks already induced by inoculation with the suspension mentioned under 2.

4. That the formation of Red Streaks can be induced by placing at the base of the young cane leaves a little of either of the suspensions mentioned under 2 and 3 without bruising or in any way wounding these leaves.

5. That the formation of all of the symptoms of Top Rot can be induced by inoculation on the immature tissues of cane stem and leaves with a watery suspension of bacteria taken from a potato-slice culture of the bacteria found in Red Streaks induced by inoculation of leaf with suspension mentioned under 2.

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3. Atherton Lee, H., and Jennings, W. C. "Bacterial Red Stripe Disease of Top Canes." Cir. No. 42. Exper. Stat., H.S.P.A, Honolulu, Hawaii, April, 1924.

4. Fawcett, G. L "Enfermedades de la Caña de Azúcar en Tucuman. Rev. Industry Agric. de Tucuman; Vol. 23, 1-2, 1922.

5. North, D. S., in an unpublished report on a visit to Hawaii. Sydney, 1924.

ILLUSTRATIONS.

1. A young stem with heart killed by Top Rot and leaves showing many Red Streaks.
2. Portion of a matured leaf about 10 in. above leaf sheath, showing Red Streaks which have developed well up on leaf blade and on midrib.
3. A typical Red Streak infected stem.
4. A glimpse into a badly Red Streak infected field.
5. Stem No. 20 of Series I. of inoculation, showing Red Streaks at base of young leaves.
6. A closer view of stem No. 20, with one leaf removed to show Red Streaks. A young watery brown streak is seen forming on leaf marked X.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

Fighting the Giant Termite.

Growers on the Burdekin should be careful, when planting, to see that cane used for this purpose does not harbour white ants.

Preventive methods of a common-sense nature must not be neglected. Endeavour, therefore, to locate any invasion of this termite in canefields, which can sometimes be traced to infested roots, old tree stumps, &c., either situated in the field or on land adjoining same. Burn all affected logs, fencing posts, or timber located on or close to headlands. Continue to use the arsenical poison-bait claimed by Mr. J. C. L. Kamp to be effective against this pest. Infestations occurring in the field far away from headlands should be combated by fumigation of the soil with carbon bisulphide or other suitable fumigants.

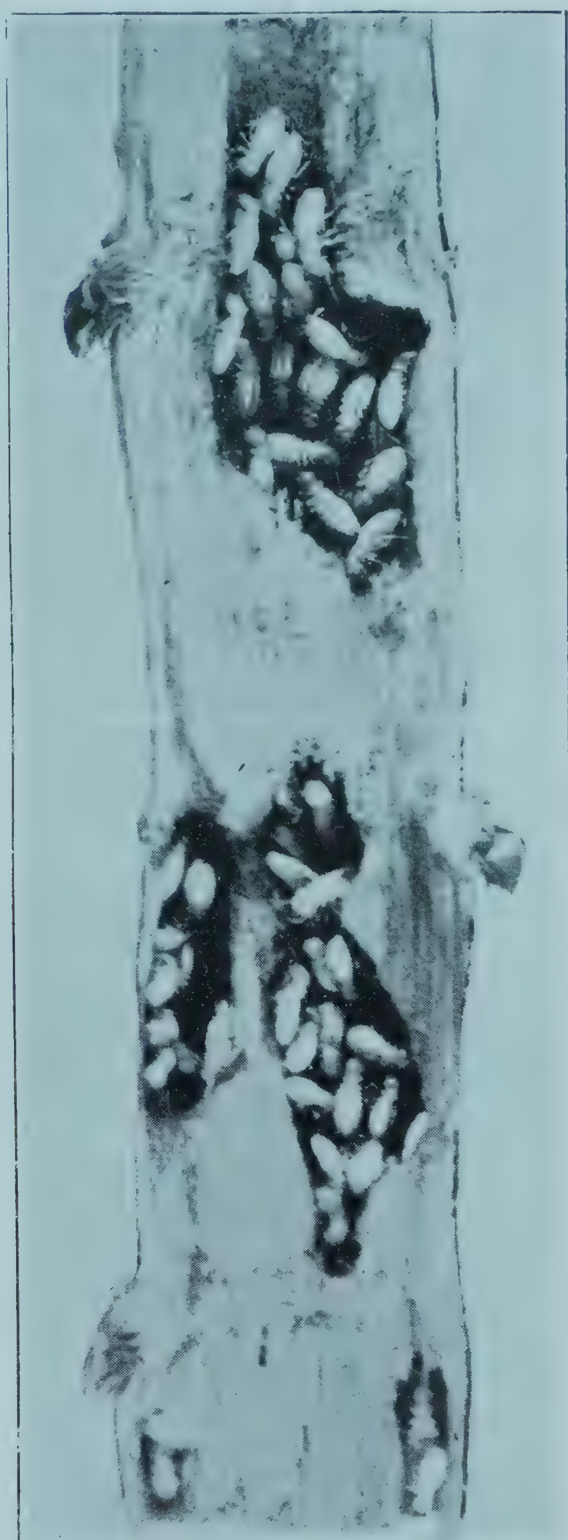


PLATE 124.—WHITE-ANTS (*Mastotermes darwiniensis*) FROGG. (NATURAL SIZE), INSIDE A STICK OF SUGAR-CANE.

How to Deal with Weevil Borers.

To discover the presence of this cane-borer in fields thought to be affected, it is a good plan to place a number of bait-traps on headlands and among the cane rows. These consist merely of pieces of split cane about eighteen inches long, placed in little heaps of from ten to twenty pieces, and covered over very lightly with trash to exclude sunlight and prevent the sticks from drying too quickly. Visit and examine these traps every second day, and if weevils be found in them among the split pieces, advise the Entomologist at Meringa without delay.

Tachinid parasites of this beetle-borer will be released by the Sugar Bureau free of cost on such infected areas, on condition the grower will agree to leave about a-quarter of an acre of such cane uncut for the flies to breed in. This should be allowed to stand for about three months, and during that time must not be burnt.

Learn to Recognise your Insect Friends.

Do not destroy soil-frequenting larvæ, &c., of beneficial insects that are parasitic or predaceous on grubs injuring your cane, and are often brought to the surface when ploughing.

Some of the commonest of these are figured and described in my Entomological Hints for March, 1925 (see "Queensland Agricultural Journal," vol. xxiii., pp. 273, 274; and "Australian Sugar Journal," vol. xvi., p. 831). Insectivorous birds should be carefully protected, and any cases of ruthless destruction of same brought under notice of the authorities. Our chief grub destroyers are the Straw-necked Ibis, White Ibis, Magpie Lark (known also as Pewee or Mud Lark), Laughing Jackass, Crow, and Swamp Pheasant. All the above, with exception of the Crow, are absolutely protected throughout Queensland. The penalty for wilfully killing, or capturing by whatever means, any of these birds is a fine of not less than one pound nor more than five pounds.

Collecting the Grubs.

Economic entomologists the world over have long recognised the advantage obtained from systematically collecting the grubs of many injurious species of root-eating scarabæidæ. In an official bulletin issued by one of the Sugar Experiment Stations at Porto Rico a few years ago, we read:—"The most successful method of controlling the 'white grub' that has yet been found, is that of collecting the grubs and beetles. The method is rather expensive, but it is the only way of keeping the pest from increasing." The fact that during the last two or three years other artificial control measures for cane-grubs have given more or less promising results should not induce us to abandon this common-sense method, which is still being advocated in other sugar-growing countries.

CONTROL OF CANE DISEASES.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (19th April, 1926) from the Assistant to Pathologist, Mr. N. L. Kelly:—

One of the most important problems confronting the canegrower to-day is the *control of diseases.* In the Nambour district, Gumming and Mosaic are the most troublesome. Fiji disease, and to a smaller extent mosaic and gumming, are causing considerable losses to the Beenleigh growers.

Gumming Disease.—The main features of gumming, the losses it causes, its distribution, symptoms, etiology, probable means of infection, and control have been dealt with in a previous report.

There are three broad control measures for all the major cane diseases:—(1) The eradication of infected fields; (2) the careful selection of seed; (3) the use of resistant varieties.

In any district in which gumming is widespread, the first measure becomes impracticable, because of its great cost. The third measure will assume great importance in the Nambour district. The varieties that are resistant or tolerant to gumming are—Q. 813, Malabar, N.G. 16, and H.Q. 285, roughly in that order. Varieties that may be planted along the fringes of gum-infected fields to test their powers of resistance are Q. 970, Q. 1098, H. 227, and probably Q. 855 and Black Innis. Those varieties to be discouraged, at present, are N.G. 15, D. 1135, E.K. varieties, M. 1900 Seedling, Gingila and Innis 131, also Gingor and 7 R. 428.

The second measure—the careful selection of seed—is very difficult to practise, except when the leaf symptoms, the yellow streaks, are showing—usually between two and eight weeks after good growing conditions, and when the cane is more than a quarter of a mile from diseased stools. When situate within this radius it cannot be *guaranteed free of gumming.* Hence the growers of the Nambour district have wisely decided, or practically decided, in favour of the establishment of an isolated experimental farm, in which new varieties can be tested, and from which seed, guaranteed clean, of the varieties desired can be obtained.

A privately-owned farm of 12 acres at Kureelpa, situate about half a mile from the nearest cane, is now being planted with clean seed of desirable varieties. Q. 813 and Malabar the farmers may safely obtain from one another, but any other varieties they desire they should obtain from this experiment farm or nursery one year before the planting in, say, one-twentieth the quantity. Any farm, to supply all the seed planted in any one year, would need to be about 200 acres instead of 12 acres, hence the necessity for one year's propagation beforehand. To minimise infection from other cane, the special seed should be planted in the farms as far from infected or any cane as possible. The cane, after one year's growth, will often be free of disease, but, in unfavourable seasons, may be lightly infected. If the growing of third and fourth, &c., ratoon crops be discontinued, and fields that are infected to a greater extent than, say, 5 per cent. be ploughed out on harvesting, there is little doubt that the general prosperity of the district will be increased, and that gumming, and, of course, mosaic, will shortly be eradicated.

Fiji Disease is present in the Beenleigh district (Q.) and on the Tweed, Richmond, and Clarence Rivers (N.S.W.). The losses it causes in susceptible varieties are enormous. In each infected stool the loss for plant cane is variable and large; for ratoon cane it is often 100 per cent.

Symptoms.—A stool on contracting the disease becomes retarded in general growth. The leaves become shortened and distorted, and later, under the leaves are formed curious galls, more or less cylindrical in shape, and elongated along the veins, and may be from one-fourth to one inch in length. They vary in colour from light green when young to dark brown at maturity. The presence of these galls is the critical symptom of the disease, though a plant may be infected for six months before showing them. At this stage the leaves become noticeably deeper in colour and more distorted, and the cane top frequently has a fan-shaped appearance. Moreover, galls of a yellowish colour are to be found on the vascular bundles of the stem by cutting it open.

The cause of the disease is not known.

It is distributed in diseased sets, but is also very infectious, though the means of infection are not known with certainty. According to one investigator, the soil may carry the infection for a time.

Control.—1. All fields more than 5 per cent. infected should be ploughed out on harvesting.

2. Avoid cutting seed from infected fields, especially on rich soil, as there the symptoms are less obvious.

3. Eliminate susceptible varieties as soon as possible. D. 1135 and Malabar are much damaged by Fiji disease. Q. 813 is, so far as is known, fairly resistant. H.Q. 285 is worthy of a ''disease resistance'' trial. Of standover canes, N.G. 16 is resistant. N.G. 15 is also resistant, but its susceptibility to gumming makes it unsafe for the Beenleigh district.

CANE CROP PROSPECTS.

The Director of Sugar Experiment Stations (Mr. H. T. Easterby) on his return from an inspection of Southern cane areas stated that although a marked improvement had taken place, due to the recent rains, the cane is still very backward owing to the dry conditions of February and March. The crops at Gin Gin are the most behindhand and at best it is only anticipated that half a crop will be harvested.

The best cane seen was at the Elliott, near Bundaberg, parts of Mount Bauple, and at Coolum and Maroochy River, Nambour. On the whole the Mount Bauple cane is most generally forward, and it has less cane pests and diseases than many other Southern areas.

In order to endeavour to provide gum-free plants in the Nambour area, the farmers are proposing to establish an isolation farm at Kureelpa, on the range, for the purpose of growing resistant varieties. This, if carefully carried out, should be of much value, and the Nambour growers deserve commendation for their action in this matter.

Extensive alterations are being made at the Moreton Mill, Nambour, and the building has been reconstructed to provide for additional machinery. Three new 6-foot mills by 35 inches are being installed, manufactured by Duncan Stewart, together with a new shredder. Ten thousand square feet of additional heating surface are being provided, and a new large Calandria pan 11 feet in diameter. An extra four crystallisers and eight more centrifugals are also being erected, as well as a new Thompson multitubular boiler. The whole of the factory has been remodelled, and the yards outside rearranged and enlarged, while 300 new cane trucks have been provided. These alterations will amply ensure that all the cane grown during the next few years will be treated without difficulty, and there will be no need for the mill to start before the cane is at its best. The estimated cost of the new plant is about £110,000.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (27th April, 1926) from the Entomologist at Meringa, Mr. E. Jarvis:—

Notes on Calcium Cyanide.

Experiments with this fumigant (cyanogas) against our cane-grubs *Lepidoderma albohirtum* Waterh. and *Lepidiota frenchi* Blackb. were first conducted by the Bureau of Sugar Experiment Stations at Meringa during 1924; when we found that 8 grains of calcium cyanide flakes would kill first-stage grubs of *albohirtum* and third-stage grubs of *frenchi* in less than twelve hours (see Bulletin No. 19, Div. of Entomology, p. 37).

Owing to encouraging results having been obtained from the above initial experiments interest was awakened in other quarters, and experiment plots treated with this fumigant were afterwards laid down, during the present season (1926), by the Colonial Sugar Refining Company, at Greenhills, in the Cairns district.

Our first field tests were carried out at Meringa during May and June, 1924, in order to determine the action of cyanogas on young roots of plant cane about twelve inches high; when we found that doses varying from 100 to 200 grains of the flaked form per stool did not injure the plants if placed 6 inches deep (about level with the sets). Bulletin No. 19, pp. 37, 49.

Early in February, 1925, preliminary field experiments at Meringa resulted in our securing a mortality of about 48 per cent. of first and second stage grubs of *albohirtum* on light volcanic soil, with doses of one scruple, injected (not drilled in) 1 foot apart on both sides of the cane stools. During the present season, 1926, we established two experiment plots last February at Meringa, preliminary results from which were reported last month by the Assistant Entomologist, Mr. A. N. Burns.

Although more adapted for treating terrestrial insects, for the fumigation of enclosed spaces, or destruction of burrowing animals, cyanogas may in the future prove serviceable also against grubs of our scarabæidæ or other subterranean insects.

Owing to its poisonous qualities it should be handled with caution by field workers, as hydrocyanic-acid gas is very deadly to animal life. As previously pointed out (Bulletin No. 19, p. 21) cyanogas flakes are more convenient to handle, and may prove to be better suited for grub fumigation than the powdered or granulated forms. It has been demonstrated that when the relative humidity of the atmosphere is about 50 per cent. or over, most of the gas is evolved during the first two and a-half hours following exposure of the chemical. This gas has been in use for the past thirty-five years or longer to destroy various Coccidæ (scale-insects) attacking fruit trees. It is easily manufactured by pouring sulphuric acid upon pieces of potassium cyanide or sodium cyanide, the poisonous fumes generated being confined in a suitable fumigating-tent which is placed over the tree infested by these insects. Hydrocyanic-acid, however, has a great affinity for water, so that best results against such subterranean insects as cane-grubs, termites, wire-worms, &c., are not likely to be obtained unless the soil be in fairly dry condition at the time of treatment.

A very moist soil will absorb quite an appreciable amount of the gas, thereby materially affecting the percentage of grub mortality hoped for from application of minimum doses. Under such adverse conditions decomposition of the calcium cyanide results principally in the formation of ammonia.

Another factor deserving consideration is that of soil porosity, attention to which in the present instance is of more importance even than when fumigating land with carbon bisulphide.

In well-drained fields the desired degree of moisture usually obtains, and after heavy rain such soils—unless, of course, too loose or too compact—soon become sufficiently aerated to permit free passage of vapour to the full depth of cultivation.

Regarding the effect exercised by cyanogas on soil bacteria, this phase of the question will need to be studied. At present, insufficiency of data precludes expression of definite opinion one way or the other. In the case of paradichlor., however, evidence obtained from an Experiment Plot at Highleigh in 1924, where grubs were not present on either the treated or control areas, showed that where paradichlor. had been applied growth of the cane was more vigorous, the stalks being noticeably longer when harvested; inclining one to think that injurious soil bacteria had perhaps been destroyed, in much the same way as happens after fumigation of cane-land with carbon bisulphide (see Bulletin No. 19, p. 42).

The Advance of Paradichlor.

Canegrowers would do well not to lose sight of the fact that paradichlor. is still holding first place among the various insecticides employed against soil-frequenting larvæ, &c., being at present used extensively both in Europe and America for controlling the ravages of subterranean and other economic insects.

In a scientific contribution by Vayssiere, published last year in Paris, we read:—"The value of paradichlorobenzene as an insecticide has been proved, and its importance is increasing rapidly." Some idea of the growing demand for this fumigant may be gathered from the fact that in the State of Georgia during 1921, 250,000 lb. weight of paradichlor. was used against a single insect-pest, *Aegeria exitiosa*, the grub of which tunnels roots of peach trees. A couple of years later, however (1923), twice that amount (viz., 223 tons) of paradichlor. was employed to combat its activities in the south-eastern portion of Georgia alone. "No tree injury," it is stated, "resulted from the use of the various doses around three, four, and five-year old peach trees in Georgia during 1921 and 1922, when normal weather conditions prevailed." This has also been the experience of growers in California and other States, no injury to root stocks having resulted from such applications. During 1922, reports from Missouri mention that "in nearly every case, the use of paradichlorbenzene against the Peach Borer showed a mortality of 100 per cent." In view of such world-wide demand one cannot wonder at the recent high prices asked for this fumigant.

Its cost, however, has already come down during the past eighteen months to about £4 per cwt., and it is probable that increased manufacture—which must follow as a matter of course—will cause the price of paradichlor. to gradually drop still lower, until reaching the vicinity of £50 per ton.

It is regrettable to note that while growers in other nations are evidently grasping with enthusiasm the opportunity which has at last been afforded them by paradichlor. for preventing huge financial losses due to the activities of certain hitherto uncontrollable insect pests, most of the cane farmers in our own country have quite failed to realise the economic significance of positive results obtained with this fumigant against our cane-grubs by the Bureau of Sugar Experiment Stations during the last three years.

The Large Cane Termite.

Recent experimentation against this pest during the last couple of years has shown that simple methods, such as poison baits applied to infested stumps, roots, posts, &c., digging out the nests and killing the queens; burning old logs and trees situated on or in the immediate vicinity of headlands, should not be neglected. Judging by preliminary results obtained by us on an Experiment Plot this season, benefit is likely to result from the practice of dipping the ends of sets before planting in dehydrated tar. This preventive method has recently been found effective in India (Calcutta, 1921-1924) against termites in sugar-cane seed beds, and is certainly deserving of further investigation in the field. Arrangements are being made by us for carrying out additional experiments against *Mastotermes darwiniensis* about the end of the present month (April) in the Burdekin district.

Mr. R. Mungomery, Assistant Entomologist, reports (20*th April*, 1926):—

Most of the Southern districts have suffered severely from the failure of the usual monsoonal rains to materialise and the consequent drought conditions that have supervened, but happily for growers in the Maryborough, Pialba, Yerra, and Mount Bauple areas, insect damage in sugar-cane is probably the lightest of any of the sugar-producing districts of Queensland, and as conditions are somewhat similar in each of the above-mentioned places I propose to group them together and discuss each insect separately.

WIREWORMS.

These insects are to be met with chiefly on the low-lying paspalum lands around Urraween and Nikenbah in the Pialba district, where they are spoken of as "wireworms" and "grubs," and growers mostly have very different ideas concerning them, so a short description of them and their habits may be of some information to those who, up to the present, have failed to recognise their attack. "Wireworms" are the larvæ of the Elateridae (Click beetles), a large family of beetles of world-wide distribution, and I would respectfully commend this name for general use in preference to the word "grubs," which, as generally used by the layman, is very indefinite and may lead to confusion with the term "white grubs" or larvæ of the Scarabaeidæ (Cockchafers).

Wireworms vary greatly in their size, as also in their habits, but the one under consideration is elongate, 1 to 1¼ in. in length, cylindrical, tough-skinned, shining, yellowish, with its body segments very much alike. The head which, together with the last segment, is of a darker brownish colour, is flat and hard and armed with powerful mandibles, and if the insect be held in the hand it is able to bury these mandibles into the skin and cause a decided pinch. The parent beetles are known as Click-beetles or Skip-jacks, because when lying on their backs they will suddenly click, jump upwards, and land again, having turned over right side up. They are familiar and frequent insects around the lights at night during certain months of the year.

Injury.

This species lives underground, and in its natural state probably lives exclusively on the roots and shoots of paspalum and other grasses, but when these paddocks are planted with cane they attack the eyes and young shoots of the cane at the most susceptible period of growth before the young plant has attained sufficient size and strength to withstand the attack. Thus blocks of cane are partially ruined at the outset. It is common for a wireworm to pierce the growing shoot, eat out the central heart, and follow this down for about its own length in the shoot, and then make its exit about an inch lower and continue on with the same injury to another growing set. The first visible signs of attack are wilting, and finally death of the central heart.

Control.

Some of these insects remain in the larval stage from one to three years, and occasionally as long as five years; so that until the life cycle and habits of these pests have been worked out and studied in detail, it will be impossible to attack them successfully from a scientific standpoint. In the meantime it would be advisable to plough in the spring and summer, and preferably plant some crop such as clover or field peas or other plant which is botanically widely separated from the grasses and which is not subject to their attack before planting up these paddocks with cane. This will ensure a good nitrogenous and green manure, as well as reducing wireworm attack to a minimum.

Also the planting of H.Q. 285 (early maturer) on these lands is recommended by the writer, for since planting in these parts is usually done in the spring, and this variety is a very good germinator and rapid grower, it is often able to become established before these pests commence their work of destruction, and has a distinct advantage over those canes which remain a long time in the soil before striking.

For valuable information on this subject I am indebted to the Hon. A. H. Moreton, who claims success against this pest by fertilising his ''sets'' when first planted with a mixture in which sulphur has been added in the proportion of 15 cwt. of fertiliser to 5 cwt. of sulphur. He gave me the approximate composition of the fertiliser as follows:—Lime 12 per cent., phosphoric acid 7 per cent., potash 5 per cent., nitrogen 4 per cent., and he applies the mixture at the rate of 2 cwt. per acre. Of four blocks on his farm that were planted at the same time, three were treated, while the other was left untreated; the treated blocks were practically unaffected, while the untreated block suffered severe wireworm damage. These blocks were situated in different parts of the farm, and it is to be regretted that no check blocks were left amongst these various blocks; but I think sufficient success was met with to warrant repeating this experiment, setting out proper checks under similar conditions, to determine whether the mixture was the potent factor in warding off wireworm attack.

Moth Borer *(Phragmatiphila truncata).*

This insect is prevalent throughout all the areas visited, and especially is it to be noticed around the headlands and in cane that has been neglected and overrun with weeds. Standover cane appears to be a very favourable breeding-ground for these pests. It is improbable that there will be a further generation of these borers in the Southern districts before the spring, and farmers who have suffered badly through these pests in the last season will be at ease on learning that no more damage is likely to accrue until then.

Lepidiota frenchi.

''Cane grubs'' or ''white grubs'' are strikingly absent in all of these districts, but a few frenchi grubs were found at Takura in some of the older forest soils, and their presence was indicated by bandicoot burrows. However, their numerical strength is very small, and they have never been in sufficient numbers to cause any extensive injury to the cane crops.

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports (19th April, 1926):—

In the course of the month the canegrowing areas of Maryborough, Pialba, and Childers were visited. Work carried out included recommendations as to fertilisation, this being based on knowledge of results on typical soils, indications and methods of control in regard to the major diseases, identification of varieties, and information as to their behaviour in relation to frost, drought, and disease. Information is also frequently sought by farmers on the questions of drainage, irrigation, and farm engineering. Effective drainage is a matter that might be studied more extensively by the growers. It is not possible in these reports to give lengthy explanation or technical details of these subjects, but cane farmers may always get further information on communication with the Bureau.

Maryborough.

Cane in this district was suffering very much from the dry spell, particularly that on the ridges. The crop on the river flats looked better, although the cane that had made was very short in every case. The three varieties making the best showing were M. 1900 Seedling, Q. 813, and H.Q. 285. The firstnamed was looking particularly well along the banks of the Mary River.

The cane at present is looking healthy. The only disease showing freely, and that chiefly on badly drained patches, was the fungoid parasite commonly known as foot-rot.

Weather conditions since the New Year have been so unfavourable that only negative results could be expected from the use of fertilisers. Results obtained, however, point to the value of manures containing potash. It is gratifying to note that fertiliser merchants follow clearly the work done by the Bureal of Sugar Experiment Stations, with the result that there are a number of mixtures of high standard on the market.

A weakness in the cane-farming localities of the Maryborough district—and it really could be applied to all the cane-growing areas in Southern Queensland—is lack of local experiment. The farmer should consider it just as important to set aside an acre of typical soil for local experiment as he considers it important to scarify his ground or erect a silo. Not only could fertilisers and cane varieties be experimented with, but also methods of cultivation, subsoiling, &c., could be practised.

Pialba.

There is a general improvement in farming standards of this district. That most important phase of cane farming—leguminous crop planting for green manures—is receiving considerable attention. As the writer has had a great many inquiries on green manuring and what it actually does for the soil, the following may be of use:—

Soil deficient in humus may be greatly enriched in that substance by growing any quick-growing crop and ploughing it in. By this practice not only is the soil enriched with material derived from the air, but a considerable amount of nitrogen which has been captured during the growth of the crop is restored to the soil. If leguminous crops such as peas or beans are grown, and the crop ploughed in, the nitrogenous store in the soil will be added to, for such crops draw supplies of nitrogen from the air.

In the case of most plants, the roots absorb from the soil water, the phosphates, potash, nitrates, &c., present, and the plant is unable to obtain any sustenance from the free nitrogen of the air. In the case of the legumes, however—peas, beans, clover, &c.—the roots possess small nodular swellings or tubercles, inhabited by micro-organisms which have the power of taking free nitrogen from the air within the soil.

Cane varieties that have best withstood the dry weather conditions in the Pialba district are Q. 813 and D. 1135. On heavy soils the H.Q. 285 and Petite Senneville have made a good showing. Another cane worth more extensive planting is E.K. 28. This cane has consistently made a good showing on high, well-drained soils.

The dry weather since Christmas has neutralised fertilising effort. There is a general tendency towards the greater use of manures than hitherto.

Pests and diseases or noxious weeds are not causing the growers serious trouble.

Childers.

Recent rain has considerably improved prospects in this district. At present the weather is warm and humid—"good growing weather" as the farmers put it. If an open winter prevails there should be a fair crop here by next September—five months in this area often represent a good deal of growth.

The improved weather conditions have stimulated activity, and a number of growers are planting.

The bulk of the cane being planted is M. 1900 Seedling. This cane appears to be doing the best on the high lands, although so far there has been very little experiment with a view to finding a cane that would possibly do better.

Owing to the long spell of dry weather, no definite information could be obtained as to fertiliser results. Farmers who have green-manured their land have noticed the cane has fared better thereon under the dry conditions than on the unmanured. Analyses of soils from Childers which have been manured with legumes show the soil to have a very fair total nitrogen and humus content.

Mosaic was showing fairly freely. There is also a considerable incidence of "foot rot." This disease appears to be spreading, and growers who have it in their fields should, when they cut this crop, plough out and give the land a lengthy fallow. The rotary cultivation should not be used where this disease occurs, but the stools should be taken out and burnt. No plants should be taken from an infected area.

Regarding mosaic and its eradication, farmers should bear in mind that maize and cane are not the only hosts that suffer from mosaic. Sorghum and some grasses are host plants, and Johnston grass also suffers from what appears to be mosaic disease. Corn mosaic frequently produces markings on the stalk similar to those produced by cane mosaic. Both diseases cause shrivelling of the stalk.

As there appears to be some confusion as to the identification of cane varieties in the Childers district, the following descriptions may be of use:—

H.Q. 10.—Moderately stout long cane, colour dull green, good stooler and ratooner, trashing easy; habit erect.

H.Q. 114.—Moderately stout cane, colour purplish, average stooler, good ratooner; trashing easy.

7 R 428 (Pompey).—Stout light-yellowish green-coloured cane, covered with a grey slate-coloured wax; internodes 4 inches long; slightly zigzag; eyes medium, full, and slightly pointed, often has two to three eyes on one node; habit erect; germination good and stools well; foliage is medium and of a dark green; trashes easily.

H. 109.—Light green to yellow cane with a rose blush covered with a white wax; eyes are flat and pointed; internodes 4 to 6 inches long, slightly barrel-shaped; erect in habit; foliage broad and plentiful; free trasher; good striker and ratooner; moderate grower.

Oramboo.—Yellowish-green cane with dark-green blotches; internodes 5 to 6 inches long and zigzag, slight hump opposite eye; has a narrow waxy ring; eyes prominent and spherical, root hairs prominent, foliage good with medium leaf; canes are inclined to lodge; is a good germinator, ratoons and stools well; trash clings slightly.

Korpi.—A dark-green cane with a copper tinge and red blotches; internodes 4 to 5 inches long, slight wax on joint, slight bulge on internode opposite eye; foliage is a little to the heavy side, cane semi-lodging, eyes spherical and fairly large; is a good germinator and ratoons well; trash is slightly clinging.

Several samples of typical soils were taken from this district for analyses.

The Northern Field Assistant, Mr. A. P. Gibson, reports (21st *April*, 1926):—

Tully and Babinda.

These lands are being gradually freed of their dense scrubs for the purpose of extending the sugar areas which are required to produce cane to satisfy the expected capacity of the new Tully Mill. Abundance of land here awaits settlement and development.

The scanty rainfall of December, and the continuance of abnormal dry conditions till late in January, is mainly responsible for the crops' present backwardness. Cane fields of which their respective areas had been included in the coming harvest must for the present be withdrawn, owing to their being so disappointingly backward, therefore the uncertainty of the total area likely to be harvested makes it almost impossible to determine, with any degree of certainty, the grand total tonnage cane likely to be crushed. However, it is computed that 4,000 acres will be cut, yielding (a conservative estimate), say, 80,000 tons.

Much of the cane seen along the railroad side was exceptionally backward, and lacked the dark-green colour which generally denotes rapid growth.

Rainfall.—143.16 inches were recorded last year, and to the 19th March the monthly precipitations were:—January 10.26, February 9.14, to 19th March 11.92; total, 31.32 inches.

The roads were in a very soggy condition, making travelling slow. The trans-Tully River farms are almost inaccessible during wet weather other than by the mill's tramway. This swiftly running stream is now spanned by a bridge.

Varieties.—Farmers must realise the extreme importance of planting disease-free cane varieties suitable for different types of soil; if this is not judiciously considered, great losses may ensue. N.G. 15 (Badila) so far is the champion of canes at present growing in the North, and where this variety will grow well it should be grown. On the poorer forest land the make-up of which varies from an impervious substrata at a shallow depth to a very coarse grainy structure (decomposed granite), soils are not generally conducive for the profitable growing of N.G. 15, but may grow the following varieties:—7 R 428 (Pompey), H.Q. 426 (Clark's Seedling), D. 1135, Q. 813, and the Goru family, N.G. 24 (Brown Goru), 24 A (Striped Goru), 24 B (Green Goru). All these are more or less subject to disease and consequently farmers must exercise the greatest of caution when planting. The Goru variety is sometimes slow in germinating and a shy ratooner—the time of harvesting has an important bearing on the latter characteristic; it is not a good standover cane. D. 1135 is a very erect growing cane, and in consequence does not cover the interspaces as rapidly as most varieties, which means that it requires to be cultivated for a greater time; this difficulty may be overcome to a great extent by making the cane drill centres 3 feet 6 inches. As a rule this variety becomes so weedy that after it has been cut three times it should be ploughed out.

Pests.—The mound-building ant was observed, more especially in the forest lands having a grainy structure.

Termites (white ants) were located in patches devouring the plant sets. Aphis Sacchari and an unusual number of leaf hoppers were noted.

Diseases.—The cane when affected with Brown Rot generally has some 12 to 14 inches of stem. On the whole this area is fairly free from disease. Leaf Scald was rather severe on one farm, having killed many stools of newly-planted N.G. 15 (Badila).

Drainage.—These sugar lands are somewhat cohesive, they gently decline from the banks of the many ever-flowing creeks and rivers, thus forming huge basins (or swamps) from which the water in excess is slow in draining away. Water continues to sink in the soil until its downward progress is arrested by some impervious medium. Should this be near the surface the water level of the soil during wet periods is raised to such a degree that the cane's root system is standing in a pool of water again. Mineral salts leached out of the soil are carried to the surface and deposited as alkali; this greatly impairs its healthy growth, hence the necessity of draining, which doubtless is one of the best mechanical operations known as a soil and crop improver.

Babinda.

Seasonal.—From a canegrowing point of view, the season so far is simply perfect, splendid nightly rains continue to fall, followed by days of misty showers and sparkling sunshine.

Rainfall.—January 40.03, February 7.90, March 19.05, to 10th April 16.31; total, 83.29 inches.

Crop Prospects.—The 1926 crop prospects at present are most encouraging; in growth it is hardly up to usual, save in isolated parts. On the whole it is clean, practically free from pests and diseases and much further advanced than any Northern sugar district so far seen.

Crushing Operations.—It is expected that crushing and harvesting will commence early in June. The estimated cane tonnage to be treated is 190,000 tons, 20,000 of which is standover; this exceeds last year's total crushed by about 26,000 tons.

Labour.—A big staff is engaged on the usual mill overhaul work. Locos. are busy hauling in the seasonal supply of firewood, the greater part of which consists of scrub hardwood. Two tramline extensions, one to and over Harvey's Creek, another through Bucklands on to what is known as 67, will be completed sometime during the season.

Manuring.—The only manure being applied at present is mill compo. It is customary to deposit this in the mill yard during crushing operations and convey it by trucks to farmers desiring it in the slack time; a charge of 5s. a ton is made, which just covers handling costs. This should be distributed over resting grounds

and ploughed in at the farmer's earliest convenience. When left by the railroad, as is noticed, it collects much seed which is eventually distributed with the manure throughout the field. Farmers continue to raise maize adjacent to their growing cane fields. This plant is too similar to cane and is troubled with some of the diseases and pests, such as Mosaic, Leaf Stripe, and even Leaf Scald. It is therefore quite feasible that the insects which frequent both crops may transport such infection from corn to cane. The sugar districts are lacking sufficient protection against the possible ignorant introduction of cane pests and diseases, mainly by the interchange of plants between farmers. Manifestly, this assists greatly in speeding up the ever-rising tide of disease, and should this practice not be arrested the industry is likely to receive some hard knocks.

Bartle Frere, the highest mountain in Queensland, looks down through misty clouds upon the extensive fields of smiling sugar-cane. The soil lying at the foot of this magnificent, densely wooded range, may be classified among the most fertile of soils now producing cane in Queensland. There are two distinct types—(1) the undulating volcanic-deep brick red, drained mainly by the picturesque Josephine Creek, and (2) the excellent Russell River alluvial deposits. The former resembles somewhat the formation of the good old Moongarra soils, though they are less extensive and have not produced for so great a time. Fortunately, these soils are blessed by a wonderful annual rainfall, which with heat is indispensable for continuous crop growth. This assured rainfall is probably brought about by the proximity of the surrounding altitudes to the coast.

Waugh's Pocket.

This comparatively new area is situated some 9 miles south from Babinda, and drained by the Canal Creek, which empties itself into a great adjoining swamp. Five growers are producing cane, mostly of the N.G. 15 variety, and expect to cut about 5,000 tons for 1926. The harvested cane is brought forward in trucks over a private railroad to the main North Coast Line and railed to the Mulgrave Mill.

Birds.—The Ibis is the most valuable of birds, and from a canegrower's point of view is worthy of every encouragement and the protection extended to them.

Pests—Grubs and Termites (white ants).—The former were observed in all classes of soil, from the porous-coarse, decomposed granite to the volcanic red throughout the area; the affected patches are mostly small but increasing daily. Farms lying near the scrubby highlands near Morriwinni are rather severely affected.

Termites.—Grubs are often credited with damage really caused by white ants. Beside devouring cane sets they also tackle the old stubble of ratoons. The aboveground appearance resembles very much the grub symptoms. A mixture of molasses, caustic soda, and arsenic, into which small pieces of soft pine are soaked and then buried shallow where they are, works wonders. If this pest is not checked it is possible that in time the sugar-cane may be found so succulent that its future young may adapt itself to living on it alone.

Diseases.—Suspicious Gum Leaf markings and the red fibre in nodes were observed (although gum could not be made to ooze out of the cane) about ¼-mile from the Babinda Mill. Several portions of leaves were forwarded to Meringa for microscopical examination, and the bacteria characteristic of the abovementioned disease were found to be present.

Leaf Scald.—There are few blocks, if any, absolutely free from this disease. Isolated small portions were found to be suffering severely. The quickest and, perhaps, most direct way to eradicate this disease is by planting disease-free sets. Any suspicious stools met with when cutting seed should be left standing and removed from the paddock as soon as possible.

The total tonnage crushed for the 1925 season at Cairns was 531,789 tons, and the sugar manufactured 72,680 tons.

Mill.	Tons Crushed.	Area Harvested.	Tons Per Acre.
Babinda	164,238	8,818	18·6
Mulgrave	179,754	10,000	17·97
Hambledon	187,797	8,543	21·98
	531,789	27,361	19·8

SOME HINTS REGARDING ENTOMOLOGICAL INQUIRIES.

By ROBERT VEITCH, B.Sc., Chief Entomologist.

The Department of Agriculture and Stock receives a considerable volume of correspondence asking for advice as to the most satisfactory means of dealing with various insect pests, and the Entomological Division of the Department is always prepared to immediately supply whatever information is available. It unfortunately happens, however, that in many cases no specimens accompany the inquiry, and, in addition to the absence of specimens, the information supplied by the inquirer as to the nature of the damage is often very limited. It thus follows that frequently no definite advice can be tendered until specimens and fuller details have been obtained by further correspondence. Such delay only too frequently means that by the time the advice is received by the inquirer the insect infestation has reached such a stage that the recommendations made are too late to be of much value in checking the particular outbreak under discussion. These recommendations will, however, always be of value for immediate application should there be any recurrence of the trouble. For the reasons just enumerated I wish to impress upon every inquirer the desirability of furnishing specimens, both of the insect responsible for the damage and also of the damage done by it, the specimens to be accompanied by full details as to the nature, extent, and duration of the outbreak. I would further stress the desirability of communicating with the Department of Agriculture and Stock when the insect attack is in its early stages, for delay usually adds to the difficulties of effective control.

The following information is supplied to ensure the receipt of insect specimens in a condition suitable for satisfactory examination and identification:—

1. Insect specimens should never be forwarded in envelopes, because, if they are at all soft-bodied, *e.g.*, fruit flies or aphis, they are generally so squashed in transit as to be of little value for specific identification, while the small harder-bodied insects frequently lose legs or heads in transit in envelopes.

2. Soft-bodied insects, such as aphis and thrips, are best forwarded in a small tube containing alcohol or methylated spirits, the tube being packed in sawdust or cotton wool in a tin matchbox or tobacco tin or similar container.

3. Small hard-bodied insects, such as beetles, wasps, and leafhoppers, are best packed in a tin matchbox; a little cotton wool or, failing that, some small pieces of newspaper used as packing inside the box will serve to prevent the insects becoming damaged through undue movement in transit. A drop or two of carbolic acid in the container before packing is of some value in preventing mould, and it also acts as a deterrent to the attacks of other small insects—*e.g.*, ants.

4. Ticks, fleas, mites, and lice can be forwarded in spirit or alcohol in tubes.

5. Butterflies and moths should be killed as carefully as possible and placed in paper triangles made as follows:—Fold along line *a* as shown in Fig. 1, then along line *b*, then along line *d*; this forms a container (shown in Fig. 2) into which the dead butterfly or moth can be slipped after its wings have been carefully folded in such a manner as to prevent the scales of the wings being rubbed off. The triangle can then be closed by folding along the line *cc* and folding along *e*. Place only one butterfly or moth in each triangle. The paper triangles can be packed in a tin and forwarded in the usual manner.

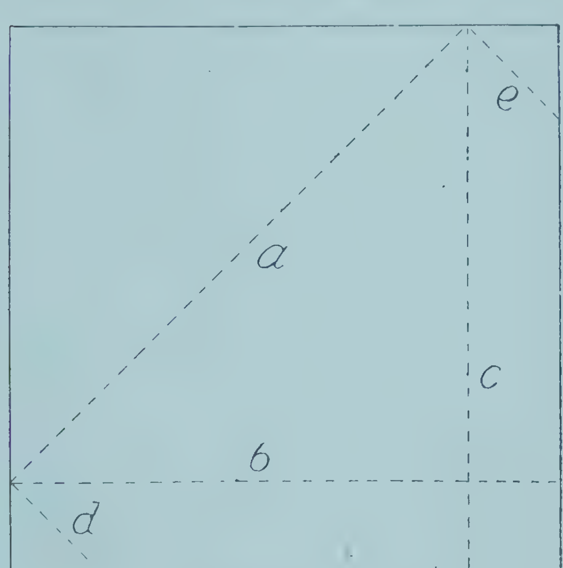


Fig. 1.

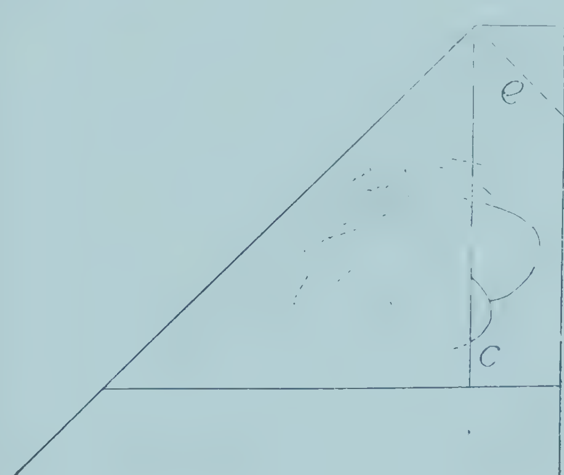


Fig. 2.

6. If the insects are in the caterpillar or grub stage and are alive, place a small quantity of their food plant in the package so that the insects will remain alive until received at the Department of Agriculture and Stock, but pack the food so that it will not move about unduly and thus injure the caterpillars or grubs.

7. If the insect has pupated place it in a tin in which its movements are reduced to a minimum by the judicious use of cotton wool or torn-up pieces of paper.

8. If the inquirer is forwarding insect-infested fruit he should on no account send it in closely sealed tins, because, as a rule, the consignments so forwarded reach the Department in such a fermented condition that the insects they contain are invariably killed by the fermentation generated in such a container; such fruit should be packed in wood wool or straw in a well aired container.

9. Large insects, such as grasshoppers, should have their abdominal contents removed before being packed in a mailing tin.

10. Where plant bugs are being forwarded it is always important to send the fully mature winged forms because the identification of the immature wingless forms is a difficult and in many cases an impossible task; in all inquiries it is desirable that the inquirer should forward as many stages in the insect's life cycle as can be conveniently obtained.

11. Insects are best killed in a "killing bottle," which consists of an ordinary strong bottle with a layer of plaster of Paris and potassium cyanide at the bottom; when this is tightly corked it becomes so charged with hydrocyanic acid gas generated by the potassium cyanide that a few minutes in the bottle generally suffices to kill most insect life.

12. Where a cyanide "killing bottle" is not available a drop or two of chloroform will be found effective in killing many insects.

Specimens of the damage should be forwarded with the insects when the inquiry is made, but it is necessary to send only the portion of the plant that is attacked—*e.g.*, the fruit, or leaf, or root, or stalk, as the case may be.

The details to be supplied by the inquirer will naturally vary, but as a rule the following should be included:—(1) Date of insect outbreak; (2) degree of severity of attack; (3) area attacked; (4) crop attacked; (5) age of crop; (6) general health of crop apart from the insect attack; (7) nature of soil and drainage; (8) nature of surroundings—*e.g.*, is the farm or orchard isolated in uncultivated land or in scrub or is it adjacent to other farms or orchards? (9) measures, if any, already taken to cope with the pest.

The forwarding of specimens and details has been dealt with at some length, because I feel that the outcome of many inquiries will be of a much more satisfactory nature if greater attention is paid to the forwarding of specimens and full details when the inquiry is originally made. All such inquiries should be addressed to the Chief Entomologist, and every effort will be made to supply all available information.

MILK VEINS AND MILK WELLS.

L. VERNEY, Dairy Inspector.

Dairymen are often heard discussing the matter of milk veins and milk wells, more especially when they foregather at show time, but it is surprising to find that there are still a large number of them who know very little of what is meant by the terms and how much importance is attached to them in relation to the milk yield.

The terms are rather vague, and although the majority of dairymen know where they are situated they have a somewhat erroneous idea as to what they are and what their function is. The veins may be located by running the hand from the front of the udder along the under side of the body towards the fore legs. The term milk veins is a misnomer, and is rather misleading, as, of course, no milk ever passes through them. In order to understand the secretion of milk it is necessary to explain the internal structure of the cow's udder The interior is largely composed of a soft spongy fibrous mass. This is known as the milk glands. They are two in number, and lie side by side, each being provided with outlets through the teats. It must be understood that the quarters are distinct from one another, and that the milk from one cannot flow into the other, the milk in each quarter being secreted from the blood supplied from the branch arteries that run from the main trunk arteries. If either of these glands be cut in two and examined innumerable ducts and cavities will be seen, some large and others very small, in fact some of them being invisible to the naked eye. When examined under a microscope several hundreds of ducts and cavities are noticed. Placed above each of the teats is what is known as a milk

cistern. These vary according to the milking capacity of the cow, but they seldom hold more than half a pint. Branching off in all directions from these milk cisterns we find the milk canals or ducts. The higher we ascend into the udder the finer they become. All these fine milk ducts end in innumerable small sack-like cavities known as alveoli. It is in the alveoli where the milk secretion takes place. Each alveolus or cell is surrounded by a dense network of arteries, veins, and lymph vessels. These various vessels supply the gland with the materials used in the composition of milk or carry away the waste blood to the milk veins. The alveoli are slightly egg-shaped, and only measure approximately five-thousandth part of an inch in length. They consist of a very thin structureless membrance lined with single epitheliæ cells. During the lactation period these cells are enlarged and swollen. During the time the cow is dry they are flattened out and sink together. They hold the milk which is formed during the time of milking. When the process of milking begins the milk flows readily from the fine milk glands into the canals or ducts, and, as these come together to the larger trunks, are united to drops of milk visible to the naked eye.

The development of a large udder necessarily implies a large blood supply, and a large blood supply means a large circulatory system, a large heart, arteries, and veins. Consequently the enlarged and tortuous veins known as milk veins are regarded as a good sign in a cow. Cases, however, have come under review where extraordinary yielding cows have not been possessed with large milk veins visible to the eye for the reason that a second and perhaps larger vein passes through the abdomen and receives the major portion of the blood from the udder.

During the time of milking the elaboration of milk goes on at a very rapid rate, and calls for an increased supply of blood to the udder. As before mentioned there the blood circulates through the very minute glands, and part of it is changed into milk. It can be readily understood that in a heavy producing cow the flow of blood to the udder will be very rapid. The waste blood is now carried from the udder through the veins to the vital organs, where it is purified once more and again circulated through the body. Where these veins enter the body will be found fairly large openings. These are known as milk wells. Great importance is attached to these milk veins and milk wells from the fact that the larger quantity of blood that can be passed through the udder during milking time (when milk is found the fastest) the better the cow will be regarded as a milk producer; consequently a cow possessing large tortuous, branching milk veins extending well forward towards the fore legs, and there entering the body through large wells or openings is usually looked upon as being strong in this important dairy point.

A great deal could be written on this subject as touching our milk production, but the foregoing is sufficient to show in a simple way that when selecting dairy cows the matter of milk veins and milk wells should not be overlooked.

CARE AND HANDLING OF CREAM.

L. VERNEY, Dairy Inspector.

Carelessness is not, as often claimed, due to a lack of knowledge, as I am confident nearly every dairy farmer has read in some agricultural paper or journal dealing with the dairying industry, or he has heard someone tell how to take proper care of milk and cream. I therefore think that it is not the knowledge that is lacking, but that it is the lack of good will. It is the carelessness, the slovenliness, the dirty habits that we must overcome. It is recognised that in some cases cream taint from weeds cannot be avoided, still it must be admitted that there are far too many defects that are, directly or indirectly, the fault of the individual dairyman Most of the defects in cream can be avoided, and at the same time a better feeling created between the supplier and the butter factory if those concerned take more interest in their cream supply.

The following hints are offered, and if suppliers will follow them out a marked improvement will be soon noticed—

1. Never fail to provide an ample supply of clean water and cloths for cleansing the udders and flanks of the cows. In dairies where large numbers of cows are milked daily it will be found necessary to change the water frequently. Always wash your hands before milking each cow. See Regulations 32 and 33 of the "*Dairy Produce Act of* 1920."

2. Do not leave the milk in open cans in the milking shed, as it is by this means that the milk absorbs the many and varied taints that arise therefrom. If it is not possible to remove the milk immediately it is drawn from the cows beyond the

confines of the milking shed, a suitable covering (a piece of thick flannelette will suffice) should be provided for each receptacle. See that these coverings are thoroughly cleansed each day and not just rinsed out in the wash-up water.

3. Do not use kerosene or petrol tins in a dairy. These receptacles are the cause of a large amount of second-grade cream owing to the fact that they cannot be properly cleansed. The open seams are the trouble.

4. It is most important that the cream be cooled as quickly as possible after separating, and always keep it in a pure, cool atmosphere.

5. Use buckets for each separation, and keep the cream well agitated each day. Before sending the cream away be sure and thoroughly mix the whole, so that a uniform sample will be obtained at the factory.

6. Always scald your cans with hot soda water as soon as you receive them from the factory. On no account place any cream in the cans until you have thoroughly cleansed and aired them.

7 Strain the cream before sending it away, and during its transit see that it is effectively shaded from the sun's rays. The cooler you can deliver your cream at the factory the better.

8. Keep your milking shed and dairy surroundings in a sanitary condition.

9. Always remember that cleanliness from start to finish is the chief factor in a first grade cream supply.

MOUNT GRAVATT EGG-LAYING COMPETITION.

Queensland poultry breeders have been responsible for the establishment of many egg-laying records from which the competition just completed does not detract.

The highest number of eggs laid for a pen of six hens was 1,626, while 306 was the top score for an individual bird. In both cases the breed was white lenghorn, owned by Messrs. W. and G. W. Hindes, of Manly.

It is believed that the Queensland record for a pen of this variety is 1,614, but, unfortunately, these birds failed by ·22 of an ounce to obtain the average weight of 24 oz. per dozen of eggs, and are consequently disqualified. There were several other pens that established high yields, but were unfortunately disqualified for the same reason. The average production per bird for twelve months was 206·6 eggs.

Following is a complete list of prize winners:—

SECTION 1.—LIGHT BREEDS, ALL WHITE LEGHORNS.

Group of Six Birds.

	Eggs.
1st—S. L. Grenier	1,468
2nd—J. J. McLachlan	1,456
3rd—G. W. Cox	1,433

Single Bird.

1st—J. Harrington	283
2nd—W. and G. W. Hindes	279
3rd—S. L. Grenier	277

Winter Test.

(Total eggs laid from 1st May to 31st July.)

1st—J. Harrington	380
2nd—W. G. Woodward	373

SECTION 2.—HEAVY BREEDS, BLACK ORPINGTONS.

Group of Six Birds.

1st—E. W. Ward	1,248
2nd—R. Burns	1,185
3rd—J. Potter	1,182

Single Bird.

1st—Mrs. A. E. Gallagher	257
2nd—E. W. Ward	250
3rd—Mrs. A. E. Gallagher	240

Winter Test.

(Total eggs laid from 1st May to 31st July.)

1st—G. E. Rogers	394
2nd—E. W. Ward	388

SCHEME FOR STANDARDISATION OF VARIETIES OF WHEAT GROWN IN QUEENSLAND AND FOR THE PROPAGATION, GRADING, CLEANING, AND DISTRIBUTION OF SEED WHEAT.

H. C. QUODLING, Director of Agriculture.

It has long been recognised that a high standard of quality in agricultural and live stock products can only be reached and maintained by systematic effort directed along certain defined lines of improvement. The wheat-grower's success and that of the industry are dependent largely on the use of varieties suitable to the environment in which they are to be grown and the system of farming adopted. In this article Mr. Quodling propounds a scheme for standardising varieties, and discusses other matters of importance to wheat-growers of Queensland.—Ed.

Conditions in Queensland differ from those common to the Southern wheat-growing States. Winter rains are not quite so regular here and, partly on this account, there will always be a demand for "late," "mid-season," "medium early," and "early maturing" rust-resistant varieties which may be planted during the currency of the season and synchronising with the length of time taken by each class of wheat to mature.

Another factor to be taken into consideration is that wheat, in many instances, is grown as a dual purpose crop, the green fodder being relied upon during the early growing season as the main part of the diet of milch cows, and to some extent for sheep, it being recognised that when abundant rains are experienced, the feeding off checks the rank growths common on such occasions to the rich soils of the Darling Downs wheat belt.

Under present-day methods of harvesting, different wheats which may be ripening simultaneously in the same field are apt to be mixed; and no matter how careful a classer who receives wheat for delivery to the existing Wheat Pool may be, it is certain that any special lines of grain reserved for seed may be more or less mixed with other varieties. When such wheat is subsequently sold as seed, it follows that in a season or two the proportion of foreign varieties will be most pronounced.

In explanation, it may be stated that in grading wheat of small or of medium size in which grain with a larger "berry" foreign to the variety is found, the latter finds its way into the No. 1 grade. In a season or two the natural increase of the larger "berried" wheat is most pronounced. Similarly, the purity of any kind of wheat may be adversely affected in an increasing ratio, if the original sample contained grain foreign to the variety being grown, or when "self-sown" wheat grows up with the crop. This will serve to show how necessary it is to start with a pure strain and to rogue fields just before harvest time, when the strangers can be more readily recognised.

Apart from the more important work of breeding and distributing wheats calculated to suit Queensland conditions, which the Department of Agriculture and Stock has carried on for practically a-quarter of a century, it is obvious that improvement in the quality, type, and yield of Queensland-grown wheat can only be brought about by the growers, through their representatives on the Wheat Pool Board, engaging in the business of raising their own seed, the best of its kind, and ensuring as far as it is humanly possible to do so, that only clean, graded grain, true to type and free from disease and impurities, is distributed and planted. With a view to bringing about a much desired improvement in this direction, a subject in which great interest has been shown by growers, a conference was held on 30th March at Toowoomba between the Wheat Board and two officers representing the Department of Agriculture and Stock, Mr. K. E. Soutter, manager and wheat breeder at Roma State Farm, and the Director of Agriculture (Mr. H. C. Quodling). The proposals (with the accompanying classification chart) put forward by the latter officer and outlined hereunder, were unanimously adopted by the Board. Action has already been taken under the scheme to select a number of seed propagation farms in different wheat-growing districts, where pure seed is to be grown this season for delivery to the Board.

To Allow the Full Time Necessary in which to Develop in Normal Seasons, the Respective Varieties should be Sown in the Principal Wheat-Growing Districts on the Darling Downs, as follows:—

SLOW MATURING	S M	Early in April.
MID SEASON	M S	2nd to 4th Week in May.
MEDIUM EARLY	M E	2nd to 3rd Week in June.
EARLY	E	4th Week in June to 3rd Week in July.

Note.—Adjustments require to be made to suit the Slight Differences in Season (earlier or later) common to other Wheat-Growing Districts.

Time of Maturity of Wheat: S M—Slow Maturing. M S—Mid Season. M E—Medium Early. E—Early.

Condition of Grain: H—Hard. M H—Medium Hard. M S—Medium Soft. S—Soft.

Types of Soils: H—Heavy Soils, Black Soil Plains.—Volcanic Loams, Downs Country. M H—Medium, Medium Heavy Loams.—Clay Loams. L and S L—Loams and Sandy Loams,—Free Working Loams including, those Alluvial in Character. S—Sandy Soils.

CLASSIFICATION.

Group.	Name of Variety.	Time of Maturity.				Condition of Grain.				Pittsworth (Eastern Boundary Linthorpe and Milmerran Branch, Mount Kent and West Thereof.				Chinchilla and West Thereof to Mungallala.				Oakey to Chinchilla including Branch Lines.				Toowoomba District, East of Oakey, including Crow's Nest and Haden Lines and extending Southerly as far as King's Creek.				Clifton, Allora, and Warwick Districts from King's Creek across the Head of Goomburra and Killarney Lines, thence to Cherry Gully and to Greymare and North-West to Ellangowan.				Greymare and along South-West Line where Wheat is Grown.				Nanango, Kingaroy, Wondai, Murgon, and Gayndah Districts.			
		S M	M S	M E	E	H	M H	M S	S	H	M H	L and S L	S	H	M H	L and S L	S	H	M H	L and S L	S	H	M H	L and S L	S	H	M H	L and S L	S	H	M H	L and S L	S	H	M H	L and S L	S
1	Amby		×				×				×	×	×		×	×	×		×	×			×	×			×	×			×	×					
1	Bunge No. 1 ..			×			×				×	×	×		×	×	×		×	×	×		×	×	×		×	×	×		×	×	×				
1	Canberra ..		×					×			×	×	×		×	×	×			×	×		×	×	×		×	×	×		×	×	×				
2	Clarendon ..			×				×				×	×			×	×			×	×			×	×			×	×			×	×				
1	Cleveland ..	×					×			×	×	×						×	×	×		×	×	×		×	×	×			×	×					

1	Cedric (Red) ..		×	×			×				×	×			×	×			×	×			×	×			×	×			×	×			×	×	
1	Coronation ..		×					×				×	×		×	×			×	×			×	×			×	×				×	×				
1	Comeback ..		×				×					×								×				×				×				×					
1	Florence ..			×	×		×			×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
2	Budds Early ..		×					×								×											×	×									
2	Currawa ..	×							×	×	×	×	×					×	×	×						×	×	×		×	×	×					
1	Gluyas		×					×			×	×	×		×	×	×		×	×	×		×	×	×		×	×	×		×	×	×				
2	Hermitage ..		×					×							×	×											×										
2	Novo			×	×	×						×				×				×				×				×				×					
1	Pusa 4			×		×					×	×				×				×				×			×	×									
2	Roma Red ..		×				×				×	×			×	×			×	×			×	×			×	×			×	×					
2	Soutter's Early				×			×							×	×																					
1	Three Seas ..			×			×				×	×			×	×			×	×			×	×			×	×			×	×			×	×	
2	Warchief ..		×						×		×	×			×	×			×	×			×	×			×	×			×	×					
1	Warren ..		×						×		×	×			×	×			×	×			×	×			×	×			×	×			×	×	
2	Warrior ..				×				×		×	×			×	×			×	×			×	×			×	×			×	×			×	×	
2	Watchman ..				×				×			×				×																					
2	Piastre																																				

The scheme proposed by the Department of Agriculture and Stock for the standardisation of varieties of wheat grown in Queensland, and for the propagation, grading, cleaning, and distribution of seed wheat, has great possibilities, and the hearty co-operation of growers is desired. Following are the details:—

1. The Department of Agriculture to co-ordinate its wheat-breeding and wheat-testing work and to link it up with the activities of the Wheat Board.

2. The scientific and technical work necessary to give effect to the scheme to be carried out as at present by the Department of Agriculture, and, when seed of new and improved varieties recommended by the Department is available from time to time in sufficient quantities, the approved grower to take it over by purchase (at a price to be mutually agreed upon at the time), and make arrangements for sowing the respective varieties in localities on picked areas, on similar lines to those detailed under Clauses 9 and 10.

3. The Board, in sequence, to secure seed from these sources, rail it to its central depôt for cleaning, fumigating, grading, and storage, for ultimate despatch to the localities decided upon for the commercial propagation of specified types of wheat.

4. For the purposes of the successful working of the scheme, and of the production of standard types of grain, the State to be classified into districts or zones, so that efforts may be directed towards the growing of suitable types and varieties within each, for delivery to and subsequent distribution by the Board. In this way it would be possible to draw upon certain classes of grain for milling or export, as may be required.

5. That a classification be made as per attached Schedule, of varieties now in cultivation, with a view to the discarding of those which are undesirable or unsuitable for Queensland conditions, or which are of soft, starchy, poor milling, or indifferent keeping qualities.

6. That the Board take the necessary steps to further this latter object, by ensuring the delivery by the grower of all wheat to the Board which comes under this latter category. In this way, the usual reservations or arrangements for next season's seed by the grower will be brought into line with the policy of standardisation, as the approved wheats can then be supplied in lieu thereof.

7. That for the purpose of ensuring the preservation of pure supplies of seed of varieties finally approved of under the scheme, the Department to continue the work of seed selection by maintaining small nursery plots at its wheat-breeding or on other farms, with the object also of the improvement by selection, and the maintenance of certain strains within the respective varieties, which could be drawn upon, should the identity or purity to type of the original varieties require to be renewed at any time.

8. That the Wheat Board appoints a man specially fitted to take charge of its seed-wheat business.

9. That Seed Propagation Farms be chosen in different districts by a member of the Wheat Board and a Field Officer of the Department, on which supplies of pure seed of one or more varieties are to be grown on clean ground from year to year, by arrangement with the owner of the farm, who would be paid a premium by the Wheat Board of, say, 6d. per bushel for approved seed drawn from crops rogued before the grain is harvested.

10. That provision be made under the scheme for the growing each year of wheats in No. 1 and No. 2 groups, representing standard and approved varieties recommended by the Department of Agriculture and Stock, and agreed upon, in conference, by the Wheat Board.

11. That up-to-date seed cleaning and grading machinery be installed by the Board at one or more centres as may be determined, so that all grain used for seed purposes may be pure to type and free from impurities.

12. That the Board endeavours to eliminate Bunt (or Smut) from all Queensland grown wheat.

13. That, in order to place the Queensland wheat-grower in the best possible position, every encouragement be given by the Board to bring about the elimination of undesirable and unsuitable varieties, and the substitution of approved kinds by sale or exchange.

14. That seedsmen dealing in seed wheat be furnished by the Department of Agriculture and Stock with an outline of the scheme, in order to secure their active co-operation in effecting its aims and objects by placing varieties purchased from the Board, or other sources, with growers in districts or zones to which such varieties have been allotted.

THE NAMING OF WOODS.

By E. H. F. SWAIN, Chairman, Provisional Forestry Board.

Whilst the botanist has been pursuing the species and their varieties with commendable zeal in order to permanently capture them for their botanical christening, and whilst he has succeeded in imposing upon the parent plants an ordered series of appropriate names, it has been left to the bushman to name and nickname the wood product of the vegetable kingdom. Despite the great commercial importance of the standardisation of timber nomenclature, the timber-getter has been left the unchallenged authority upon the subject, and he has made a shocking mess of it. He has spoken in many voices and in many places, and there is babel in the timber world to-day.

In one district a tree is called Blue Gum because the bark is bluish, and in another it is called Red Gum because the wood is red. There is a Blue Gum in Tasmania which has a yellowish wood, and a Blue Gum in New South Wales with a red wood, and also a River Red Gum—and the Blue Gum is often called Flooded Gum and is unrelated to the Queensland Blue Gum, which is really Red Gum.

There is a Crow's Foot Elm which is also called Booyong, Raywood, Ash-Meganti, Stavewood, Ironwood, Silky Elm, Brown Oak, and Hickory according to the district, whilst in the Philippines it is known as Lumbayao. There is a Crow's Ash in Queensland which is called Teak in New South Wales, yet it is unlike Teak, whilst the wood that is of the Teak type in structure, uses, and botanical order has been dubbed Beech after the European Beech, to which incidentally it bears no resemblance whatever. There is a Red Mahogany in New South Wales, called so by the early settlers because of its superficial resemblance to Honduras Mahogany, and there is another tree resembling Red Mahogany in bark and habit, which, as a corollary, has been called White Mahogany because the wood is white. In Queensland, both these woods are called Red and White Stringybark; but White Stringybark in New South Wales is a different wood again, a wood, however, which in structure is of the Western Australian Jarrah type. There is a Bolly Gum which is not a gum at all, but a timber resembling Queensland Maple, which is not a Maple either, but was originally called Red Beech (because it is somewhat like White Beech) which is not like Beech at all, but is really an Australian Teak.

The confusion is extraordinary, but the same haphazard naming of woods is proceeding all over Australia and science fears to tread where the bush lawyer rushes in.

Absence of Laws for Timber Nomenclature.

That the matter is of importance to forestry and the timber industry as a whole is indicated by the attempts made by successive Australian Forestry Conferences to secure agreement, but agreement even between those with a common aim has not been practicable so far because the laws of timber nomenclature have not yet been enacted. To me it appears that the consideration and adoption of principles is the first and greatest step.

Custom hallows even an unsuitable appellation if it be single in its blessedness, but, fortunately for the future of the Australian timber markets, there are so many name competitors for selection that even if it became difficult to choose between them, a compromise or non-compromise candidate may always be secured. The fact that an unsuitable name exists or has existed for twenty years is not warrant, therefore, for its enthronement for the rest of time.

In choosing a standard series of timber names, it appears to me that we may very well take a leaf off the botanist's family tree. Orders and genera are stable and may not be upset by unscientific usurpers. If a Linden tree is a Linden tree, it remains a Linden tree the world over. If a Pinus is a Pinus in Europe, it cannot be called a Juniperus in the Antipodes. If a Mahogany wood is a Mahogany wood in Honduras or London Docks, then only woods of the same structure, type, and value standards should be styled a Mahogany elsewhere. If Teak is the established name for a definite sort of timber, the name must not be usurped by a pretender with none of the reigning blood in him. If a Box is a certain type of wood accepted the world over as the type suitable for specific purposes, such as draftsmen's scales, then our Yellow and Grey Boxes are usurpers, for they really belong to the Ironbark set. If our White Beech is really of the Teak family of woods, it should be called Australian Teak instead of awarding the name to *Flindersia australis* which has no resemblance to Teak.

Let us accept the established orders of wood types the world over, the Mahoganies, the Rosewoods, the Oaks, the Ashes, the Alders, the Birches, the Boxwoods, the Teaks, the Beeches, the Bulletwoods, the Walnuts, and so on. Let us erect these definite and accepted wood types as our commercial genera and if of such types we have an Australian representative let us attach the appropriate adjective. If we have still other types let us establish new genera.

An appropriate set of principles for wood naming might be as follows:—

(1) Timbers should be named upon their timber values and not upon the appearance of the parent tree.

Red Gum should not be called Blue Gum in Queensland because the bark is blue. The generic substantive should place the wood in its structure type, whether it be a Beech or an Oak type, and the specific adjective should describe the colour or other special quality of the wood type. An Oak wood may be White or Red and a Walnut wood may still be called a Walnut even if it be a Pink Walnut.

Burgundy and Champagne were local names but they are now established world standards for certain types of wine. Because Australia produces these types of wine in Australia, there is no reason why we should call them Wantabadgery or Woolloomooloo. Australian Burgundy and Australian Champagne are legitimate and suitable names. And so with timber.

(2) Established English spoken names for wood types should be continued in Australia with such adjectival differentiation as may be appropriate to them.

(3) Distinctly Australian wood types—that is to say, new wood genera—may and should certainly be given new or Australian generic names—the Ironbarks for instance.

If these principles be accepted and applied, as they are in botanical science and in every other science, we shall have a new condition of things wherein every wood has only one type name, and that type name so appropriate and descriptive that its acceptance by the commercial world becomes inescapable. I agree that if a name is not appropriate and descriptive it has small chance of survival even if arbitrarily imposed, but I am sure that the timber world would welcome the scientific definition which it now lacks in wood nomenclature. Science has no right to stand apart from industry and content itself with Latin christenings. Let us, therefore, endeavour scientifically to dispose of the babel of unauthorised versions of timber names.

The System of the Queensland Forest Service.

The Queensland Forest Service has adopted a system of classifying timbers, by means of an index, which has been styled an Universal Wood Index, and which more or less brings together in their due sequence all the well-known woods in the world. It becomes possible thereunder to group them into their commercial genera, and then to apply to them the appropriate trade appellation and its local specific adjective. As a corollary to the work of the wood Index, an attempt has been made to apply to Queensland woods the general principles of nomenclature here laid down. The index has not been slavishly followed where certain unindexed factors tends to push a wood out of its index class, and every effort has been put forth to secure a name which is appropriate, description, and as far as possible acceptable to trade. (The names which have been adopted are published in the list appended.) In some cases, proposals more or less radical are made. The fact that our Box is not a Boxwood has led me into my most revolutionary proposition which is that we should have here two generic groups, the Boxwoods and the Ironboxes, so that Grey and Yellow Box which abide with the Ironbark set would become Grey Ironbox and Yellow Ironbox. Similarly, Grey Gum, which as a wood is so close to Grey Ironbark that it is extremely difficult to separate therefrom, would become Grey Irongum, and thus be removed from the lighter, softer gum tree woods such as Flooded and Scribbly Gums—an entirely different type.

Apart from these overbold but justifiable departures from constant usage, no very grave considerations arise to which exception can be taken. If general principles are followed, the new names, or any popularly acclaimed improvement of any of them, will stand on their own feet and serve the timber trade as it never has been served before.

QUEENSLAND FOREST SERVICE INDEX COLLECTION OF TIMBER WITH COMMON NAMES AND ADOPTED OFFICIAL VERNACULARS.

Botanical Identity.	Present Vernacular.	Official Vernacular.
Erythrina indica	Cork Tree	Grey Corkwood
Erythrina vespertilio	Cork Tree, Shield Tree, Coral Tree	Grey Corkwood
Cordia Myxa	Sebastian Tree	Grey Corkwood
Ficus glomerata	Cluster Fig (N. Queensland)	Brown Figwood
Ficus macrophylla	Moreton Bay Fig	Brown Figwood
Elæocarpus grandis	Quandong, Blue Fig (N.S.W.), Silver Beech, Caloon	Silver Quandong
Elæocarpus coorangooloo	Coorangooloo	Brown Quandong
Elæocarpus ruminatus	Quandong (Mackay)	Grey Quandong
Ailanthus imberbiflora	White Bean (Imbil) Sassafras (Samford)	White Siris
Albizzia toona	Mackay Cedar, Acacia Cedar (Cairns)	Red Siris
Aleurites moluccana	Candlenut (Atherton)	Candlenut Siris
Pithecolobium pruinosum	Snowwood (Imbil)	Tulip Siris
Pithecolobium grandiflorum	..	Tulip Siris
Gmelina Leichhardtii	White Beech (South Queensland)	Grey Teak
Gmelina fasciculiflora	White Beech (Atherton)	Grey Teak
Flindersia acuminata	Putts Pine (Atherton) Silver Maple	White Silkwood
Flindersia Brayleyana	Maple, Queensland Maple, Red Beech (Atherton)	Maple Silkwood
Flindersia Pimenteliana	Silkwood Silky Maple (Atherton)	Rose Silkwood
Lucuma galactoxyla	Cairns Pencil Cedar Cairns Maple	Red Silkwood
Cinnamomum Tamala	Native Camphor	Camphorwood
Cinnamomum Oliveri	Native Camphor	Camphorwood
Litsea reticulata	Bolly Gum, Bally Gum (N.S.W.) Sycamore (N.S.W.)	Brown Bollywood
Litsea ferruginea	Soft Bolly Gum Bolly Beech	Brown Bollywood
Persea Baileyana	Nutmeg Bark (Fraser Is.)	Brown Bollywood
Cryptocarya Bancroftii	Yellow Walnut (Atherton)	Canary Ash
Flindersia Schottiana	Bumpy Ash (Queensland) Cudgerie (N.S.W.)	Silver Ash
Flindersia australis	Crow's Ash (Queensland) Teak (N.S.W.) Flindosa (N.S.W.) Flandowsee (Queensland)	Crow's Ash
Flindersia pubescens	Ash (Atherton)	White Ash
Flindersia collina	Stave Wood (N.S.W.) Hill Flindersia (N.S.W.) Leopard Wood (Q'land)	Leopard Ash
Flindersia Bourjotiana	Ash (Atherton)	White Ash
Flindersia Ifflaiana	Cairns Hickory	Hickory Ash
Flindersia Oxleyana	Yellowwood (Sth Q'land) Flandowzee (Maryborough)	Yellowwood Ash
Flindersia Bennettiana	Mountain Ash Bennett's Ash	Bennett's Ash
Euroschinus falcatus	Pink Poplar, Maiden's Blush, Ribbonwood (N. Queensland) Cudgerie (Queensland)	Blush Cudgerie
Bursera australasica	Mango Bark (Fraser Is.)	Brown Cudgerie
Trema amboinensis	Peach Leaf Cedar (North (Queensland)	Brown Cudgerie
Panax Murrayi	..	Pencil Cudgerie
Alstonia scholaris	Milkwood (N. Queensland)	White Cheesewood

QUEENSLAND FOREST SERVICE INDEX COLLECTION OF TIMBER WITH COMMON NAMES AND ADOPTED OFFICIAL VERNACULARS—*continued.*

Botanical Identity.	Present Vernacular.	Official Vernacular.
Sarcocephalus cordatus ..	Leichhardt Tree (North Queensland)	Yellow Cheesewood
Melia composita ..	White Cedar .. .. Brown Cedar	Tulip Cedar
Cedrela australis	Red Cedar	Red Cedar
Schizomeria ovata ..	Whitewood (Fraser Island) Crab Apple Pine Humbug (S. Queensland)	White Sycamore
Synoum glandulosum ..	Scentless Rosewood (Fraser Island)	Red Sycamore
Weinmannia spp.	Blood-in-the-bark (North Queensland)	Satin Sycamore
Evodia ovatiflora	..	Cork Sycamore
Evodia micrococca ..	Stinker (Imbil)	Silver Sycamore
Evodia littoralis	..	Silver Sycamore
Musgravea stenostachya ..	Brown Oak (Atherton) ..	Briar Oak
Macadamia præalta ..	Bull Nut (Imbil)	Nut Oak
Embothrium Wickhamii ..	Pink Oak (N. Queensland)	Satin Oak
Macadamia ternifolia ..	Queensland Nut .. .. Bauple Nut	Bauple Oak
Cardwellia sublimis ..	Bull Oak (N. Queensland) Silky Oak (S. Queensland)	Silky Oak
Helicia sp.	Silky Oak (Mackay) ..	Silky Oak
Grevillea robusta	Silky Oak, Scrub Beefwood (S. Queensland) Black and White Silky Oak (Northern Rivers, N.S.W.)	Silky Oak
Grevillea Hilliana ..	..	Beef Oak
Orites excelsa	Silky Oak (Killarney) ..	Waratah Oak
Carnarvonia araliæfolia ..	Red Oak (N. Queensland)	Caledonian Oak
Grevillea pinnatifida ..	Glassy Oak	Beef Oak
Grevillea striata	Beefwood (N. Queensland)	Beef Oak
Banksia serrata	Wallum	Wallum Oak
Banksia æmula	Honeysuckle (N.S.W.) ..	Wallum Oak
Banksia integrifolia ..	Honeysuckle .. .. Wallum White Honeysuckle Coast Honeysuckle	Honeysuckle Oak
Banksia littoralis	..	Honeysuckle Oak
Xylomelum pyriforme ..	Wooden Pear	Pear Oak
Stenocarpus sinuatus ..	White Oak .. .. Wheel of Fire Tree (North Queensland)	White Oak
Hakea lorea	Needlewood	Needlewood Oak
Ackama Muelleri	Pencil Cedar .. .. Sugar Bark (Mackay) A Corkwood (N.S.W.)	Pencil Alder
Ackama quadrivalvis ..	Feathertop (N. Queensland) Pencil Cedar	Rose Alder
Eugenia parvifolia ..	Water Myrtle .. .. Cherry (Fraser Island)	Cherry Alder
Exocarpus cupressiformis ..	Forest Cherry .. .. Mock Cherry (Imbil) Native Cherry (N.S.W.)	Pink Cherrywood
Commersonia echinata ..	Fibrewood (Imbil) ..	Brown Kurrajong
Codoncarpus australe ..	Kurrajong	Brown Kurrajong
Stercolia discolor	Sycamore Tree .. .. Hat Tree White Poplar	White Kurrajong
Stercolia acerifolia ..	Flame Tree .. .. Scrub Kurrajong	Flame Kurrajong
Stercolia diversifolia ..	Forest Kurrajong ..	Forest Kurrajong

QUEENSLAND FOREST SERVICE INDEX COLLECTION OF TIMBER WITH COMMON NAMES AND ADOPTED OFFICIAL VERNACULARS—*continued.*

Botanical Identity.	Present Vernacular.	Official Vernacular.
Pleiococca Wilcoxiana ..	Mushy Berry (Fraser Is.) ..	Silver Aspen
	Wilcox Wood (Mackay)	
Podocarpus amara ..	Black Pine (Atherton) ..	Black Pine
Podocarpus elata	She Pine (S. Queensland) ..	Brown Pine
	Brown Pine	
	Brush Pine (N.S.W.)	
Araucaria Cunninghamii ..	Hoop Pine	Hoop Pine
	Moreton Bay Pine (Q'land)	
	Colonial Pine (Sydney)	
	Richmond River Pine (N. Rivers, N.S.W.)	
Araucaria Bidwilli ..	Bunya Pine (Queensland)	Bunya Pine
Agathis robusta	Dundathu Pine	Kauri Pine
	Kauri Pine (S. Q'land)	
Agathis Palmerstoni ..	Kauri Pine (N. Q'land) ..	Kauri Pine
Callitris glauca	Cypress Pine	Western Cypress
	White Cypress (W. Q'land)	
Callitris arenosa	Sand Cypress	Coast Cypress
Callitris calcarata ..	Black Cypress (W. Q'land)	Black Cypress
	Black Pine and Red Pine (N.S.W.)	
Hibiscus tiliaceus	Coast Cotton Tree ..	Green Cottonwood
Panax elegans	Celery Wood (S. Q'land) ..	Silver Basswood
	Black Pencil Cedar (N.S.W.)	
Duboisia myoporoides ..	Corkwood	White Basswood
Doryphora sassafras ..	Sassafras (S. Q'land) ..	Grey Sassafras
	Black Sassafras (N.S.W.)	
Daphnandra micrantha ..	Yellow Box (Imbil) ..	Grey Sassafras
	Yellow Sassafras	
	Light Yellowwood (N.S.W.)	
	Socket Wood	
Daphnandra repandula ..	Sassafras	Grey Sassafras
Daphnandra aromatica ..	Sassafras	Grey Sassafras
		Red Carrobean
Sideroxylon Richardii ..	Coondoo	Blush Coondoo
	Milk Bark (S. Queensland)	
Eugenia Francisii ..	Watergum (Imbil) ..	Pink Satinash
Eugenia spp.	Red Eungella Gum ..	Rose Satinash
Eugenia helimampra ..	Hard Cherry	Rose Satinash
	Red Myrtle (Fraser Island)	
Eugenia sp.	White Eungella Gum ..	Grey Satinash
Eugenia gustavioides ..	Water Gum (N. Q'land) ..	Yellow Satinash
Eugenia brachyandra ..	Pink Plum (Imbil) ..	Brown Satinash
Eugenia Ventenatii ..	Water Myrtle (Imbil) ..	Myrtle Satinash
Eugenia macoorai ..	..	Red Satinash
Cryptocarya Mackinnoniana	Koongoojaroo	Grey Walnut
Cryptocarya erythroxylon ..	Pigeonberry Ash (S. Q'ld.)	Rose Walnut
	Southern Maple	
Cryptocarya obovata ..	Purple Laurel (Imbil) ..	White Walnut
	Pepperberry Tree	
	She Beech (N.S.W.)	
Endiandra discolor ..	Plum	Rose Walnut
	Apple	
	Tick Wood (N.S.W.)	
Endiandra Sieberi	Corkberry (Fraser Island) ..	Rose Walnut
	Corkwood and Till (N.S.W.)	
Beilschmiedia elliptica ..	Hard Bolly Gum	Grey Walnut
	Walnut (Fraser Island)	
Beilschmiedia obtusifolia	Hard Bolly Gum (Imbil)	Blush Walnut
	Pencil Berry (Fraser Is.)	
Cryptocarya corrugata ..	Corduroy (N. Queensland)	Oak Walnut
Alphitonia franguloides ..	Sarsaparilla (N. Q'land) ..	Blush Butternut

QUEENSLAND FOREST SERVICE INDEX COLLECTION OF TIMBER WITH COMMON NAMES AND ADOPTED OFFICIAL VERNACULARS—*continued.*

Botanical Identity.	Present Vernacular.	Official Vernacular.
Blepharocarya involucrigera	Bolly Gum (N. Q'land)	Rose Butternut
Eucalyptus saligna	Flooded Gum (Q'land)	Rose Gum
	Sydney Blue Gum (N.S.W.)	
	Blue Gum (N.S.W.)	
	Brush Gum (N.S.W.)	
Eucalyptus dealbata	Inland Red Gum (N.S.W.)	Blood Gum
	Crossed Gum	
	Tumble Down Gum	
Castanospermum australe	Moreton Bay Bean	Black Bean
	Moreton Bay Chestnut	
	Black Bean	
	Beantree	
Endiandra Palmerstoni	Black Walnut (N. Q'land)	Walnut Bean
Dysoxylon Muelleri	Red Bean	Miva Mahogany
	Kedgy Kedgy	
	Miva	
Dysoxylon cerebriforme	North Red Bean	Miva Mahogany
	Brain Fruit (N. Q'land)	
Dysoxylon Fraseranum	Rosewood (N.S.W.)	Rose Mahogany
	Rose Mahogany (Q'land)	
Acacia implexa	Black Wattle (Fraser Is.)	Brown Salwood
Acacia Cunninghamii	Black Wattle (Brisbane)	Brown Salwood
Acacia aulacocarpa	Hickory Wattle	Brown Salwood
	Blue Wattle (Imbil)	
	Brush Ironbark (N.S.W.)	
Acacia Bakeri	White Wattle	White Salwood
	Hickory	
		Yellow Beech
Villaresia Moorei	Soap Box (Killarney)	Silky Beech
	Churnwood (N.S.W.)	
Pennantia Cunninghamii	Pennantia (Fraser Island)	Brown Beech
Symplocos Thwaitesii	..	Satin Beech
Rhodosphæra rhodanthema	Yellow Cedar	Yellow Satinwood
	Deep Yellowwood	
	Chinaman's Cedar	
	Yellowwood (N.S.W.)	
Zanthoxylum veneficum	Satinwood	Canary Satinwood
Litsea dealbata	Small Litsea (Imbil)	Grey Birch
Cryptocarya glaucescens	Filipino (Imbil)	Yellow Birch
Elæocarpus obovatus	Beech	White Carrobean
	Blueberry Ash (Imbil)	
Litsea chinensis	..	White Carrobean
Sloanea Woolsii	White Carrobean (S. Q'land)	Grey Carrobean
Sloanea australis	Pencil Cedar (Imbil)	Blush Carrobean
	Maiden's Blush (N.S.W.)	
	Salter's Cedar	
Weinmannia Benthami	Red Carrobean	Red Carrobean
Pseudomorus Brunoniana	Waddy Wood	White Handlewood
	Ragwood (Imbil)	
Aphananthe Philippinensis	Prickly Fig (Benarkin)	Grey Handlewood
	Axehandlewood (Imbil)	
Elæocarpus Eumundi	Eumundi (Fraser Island)	White Ooline
Emmenospermum alphitonioides	Yellow Ash (Imbil)	Pink Ooline
Rhodamnia trinervia	Scrub Stringybark	Brown Malletbox
	Scrub Turpentine (N.S.W. and Queensland)	
Rhodamnia argentea	White Myrtle	Brown Malletbox
	Freewood	
	Grey Myrtle (Imbil)	
Rhodamnia acuminata	Myrtle	Brown Malletbox
Diploglottis Cunninghamii	Native Tamarind	Pink Tamarind

QUEENSLAND FOREST SERVICE INDEX COLLECTION OF TIMBER WITH COMMON NAMES AND ADOPTED OFFICIAL VERNACULARS—*continued.*

Botanical Identity.	Present Vernacular.	Official Vernacular.
Nephelium Lauterianum ..	Mackay Maple .. .. Fraser Island Tamarind	Blush Tamarind
Cupania pseudorhus ..	Fern Tree .. .. Pink Foambark (Imbil)	Pink Tamarind
Cupania xylocarpa ..	White Foambark (Imbil) ..	White Tamarind
Cupania anacardioides ..	Tuckeroo	Rose Tamarind
Cupania serrata	..	White Tamarind
Cupania semiglaucum ..	..	White Olivewood
Amoora nitidula ..	Incense Wood (Imbil) .. Jimmy Jimmy Bog Onion (N.S.W.)	Rose Kamala
Baloghia lucida	Scrub Bloodwood (Imbil).. Brush Bloodwood (N.S.W.)	White Kamala
Mallotus Philippinensis ..	Kamala (Imbil)	Pink Kamala
Marlea vitiensis var. tomentosa	Black Heart (Imbil) .. Ebony (Imbil)	Black Muskheart
Tarrietia argyrodendron ..	Crow's Foot Elm .. .. Booyong Stavewood Hickory Ironwood Ash Meganti	Brown Tulip Oak
Tarrietia macrophylla ..	Crow's Foot Elm	Blush Tulip Oak
Tarrietia actinophylla ..	Black Jack (S. Q'land) .. Stavewood and Ironwood (N.S.W.)	Blush Tulip Oak
Tarrietia peralata	Red Crow's Foot Elm (N. Queensland) Atherton Red Oak	Red Tulip Oak
Angophora lanceolata ..	Rusty Gum .. .. Red Gum Sugar or Cabbage Gum	Brown Applegum
Eucalyptus trachyphloia ..	White, Yellow, or Bastard Bloodwood	Brown Bloodwood
Eucalyptus peltata ..	..	Brown Bloodwood
Eucalyptus corymbosa ..	Red Bloodwood	Red Bloodwood
Eucalyptus Planchoniana	Planchon's Stringybark (Sunnybank) Bastard Tallowwood (N.S.W.)	White Messmate
Eucalyptus Clœziana ..	Gympie Messmate .. Dead Finish (N. Q'land)	Yellow Messmate
Eucalyptus resinifera ..	Red Stringybark Jimmy Low (Queensland) Red Mahogany (N.S.W.) Forest Mahogany (N.S.W.)	Red Messmate
Eucalyptus pellita ..	Red Stringybark	Red Messmate
Eucalyptus pilularis ..	Blackbutt (N.S.W. and Queensland) Great Blackbutt (N.S.W.)	Grey Blackbutt
Eucalyptus eugenioides ..	White Stringybark (Queensland and N.S.W.)	Pink Blackbutt
Eucalyptus robusta ..	Swamp Mahogany (N.S.W.) Robusta (Fraser Island)	Red Blackbutt
Diospyros pentamera ..	Black Myrtle (Benarkin) .. Persimmon Wood	Grey Calamanderwood
Maba fasciculosa	Black Ebony (Imbil) ..	Grey Calamanderwood
Casuarina torulosa ..	Forest Oak .. .. Red Oak	Rose She Oak
Casuarina Cunninghamiana	River or Creek Oak (Imbil) River or White Oak (N.S.W.)	Brown She Oak
Casuarina Luchmanni ..	Bull Oak (Dalby) (N.S.W.)	Red She Oak
Casuarina inophloia ..	Stringybark Oak (Dalby)..	Threaded She Oak

QUEENSLAND FOREST SERVICE INDEX COLLECTION OF TIMBER WITH COMMON NAMES AND ADOPTED OFFICIAL VERNACULARS—*continued.*

Botanical Identity.	Present Vernacular.	Official Vernacular.
Pleiogynium Solandri	Burdekin Plum (Rockhampton) Sour Plum	Tulip Plum
Owenia cepiodora	Onionwood (Yandina)	Rose Almond
Owenia venosa	Rose Apple (Yarraman)	Rose Almond
Calophyllum costatum	Calophyllum (Cairns)	Satin Poonwood
Avicennia officinalis	Grey or White Mangrove	Grey Mangrove
Callistemon viminalis	Red Bottlebrush	Red Bottlebrush
Weinmannia lachnocarpa	Marara (S.Q.)	Rose Marara
Exæcaria Dallachyana	Milkwood "Blind your Eyes"	White Marara
Alstonia villosa	..	White Marara
Heimieyelia australasica	Grey Birch (Imbil)	Grey Marara
Capparis Mitchellii	Wild Orange	Buff Orangewood
Capparis nobilis	Wild Orange Black Thorn	White Orangewood
Olea paniculata	Wild Olive (Imbil)	Olive Cornelwood
Alphitonia excelsa	Red Ash (Imbil) Leather Jacket Cooper's Wood (N.S.W.) Humbug (Illawarra Dist.)	Red Cornelwood
Citrus australis	Lime Wild Lemon	White Cornelwood
Citrus australasica	Finger Lime	White Cornelwood
Acronychia melicopioides	..	White Cornelwood
Nephelium distyle	..	Silver Cornelwood
Acacia doratoxylon	Mulga	Mulga Lancewood
Albizzia basaltica	Dead Finish (W. Q'land)	Red Lancewood
Harpullia pendula	Tulip	Tulip Lancewood
Guettarda putaminosa	..	Yellow Lancewood
Eucalyptus umbra	Yellow Stringybark (Fraser Island)	Yellow Stringybark
Eucalyptus acmenioides	Yellow Stringybark (Q'land) White Mahogany (N.S.W.)	Yellow Stringybark
Endiandra compressa	White Bark (Imbil) Golden Birch	Queensland Greenheart
Vitex lignum-vitæ	Lignum Vitae Black Heart Golden Box	Satin Hollywood
Pittosporum rhombifolium	White Holly Inkberry (Imbil)	White Hollywood
Syncarpia Hillii	Fraser Island Turpentine	Red Satinay
Syncarpia laurifolia	Turpentine (S. Q'land) Turpentine Tree (N.S.W.) Red Turpentine (N.S.W.)	Turpentine
Tristania conferta	Brush Box (N.S.W.) Scrub Box Brisbane Box	Brush Box
Tristania suaveolens	Swamp Mahogany (Q'land) Swamp Turpentine (N.S.W.)	Swamp Box
Tristania laurina	Kanuka (Queensland) Water Gum (Q. and N.S.W.)	Water Box
Syncarpia subargentea	Scrub Ironwood (Imbil)	Ironwood Box
Eremophila Mitchelli	Sandalwood (W. Q'land) Budda (N.S.W.)	Sandal Box
Randia chartacea	Sour Leaf Mock Loquat Jasmine	White Papajarin
Canthium latifolium	..	Brown Papajarin
Siphonodon australe	Ivorywood Wild Guava Floor Wood	Ivorywood
Scolopia Brownii	..	Pink Pearwood

QUEENSLAND FOREST SERVICE INDEX COLLECTION OF TIMBER WITH COMMON NAMES AND ADOPTED OFFICIAL VERNACULARS—*continued*.

Botanical Identity.	Present Vernacular.	Official Vernacular.
Hodgkinsonia ovatiflora ..	Mock Olive (Yarraman) ..	Brown Boxwood
Strychnos arborea ..	Needle and Thread Wood Sago Wood	Threaded Boxwood
Lucuma sericea	Silky Hornbeam	Brown Boxwood
Chrysophyllum proiniferum	..	Pink Boxwood
Sideroxylon Pohlmanianum	Engravers' Wood (Imbil) ..	Yellow Boxwood
Lysicarpus ternifolius ..	Budgeroo .. .. Tom Russell's Mahogany Mountain Oak	Mountain Myrtle
Myrtus Hillii	Ironwood (Imbil) ..	Ironwood Myrtle
Drymophlæus Normanbyi..	Black Palm (Cooktown) ..	Black Palm
Davidsonia pruriens ..	Davidsonian Plum (N. Q.)	Purple Bulletwood
Dissiliaria baloghioides ..	Red Heart (Imbil) .. Howah	Red Bulletwood
Petalostigma quadriloculare	Quinine Berry .. Wild Quinine	Brown Bulletwood
Sideroxylon myrsinioides ..	..	White Bulletwood
Sideroxylon australis ..	Black Apple .. .. Native Plum	Silver Bulletwood
Erythrophlœum Laboucherii	Leguminous Ironbark .. Cooktown Ironbark	Red Cocobolo
Eucalyptus melliodora ..	Yellow Box (N.S.W. and Dalby) Yellow Jacket (West N.S.W.)	Yellow Ironbox
Acacia falcata	..	Rose Spearwood
Acacia excelsa	Ironwood Wattle (Dalby)	Iron Spearwood
Acacia harpophylla ..	Brigalow (W. Queensland)	Brigalow Spearwood
Acacia Cambagei	Gidyea .. .. Gidya (W. Queensland)	Gidya Spearwood
Acacia rhodoxylon ..	Rosewood (Dalby) ..	Brown Spearwood
Bauhinia Hookeri	Mountain Ebony (Central Queensland)	Brown Pegunny
Bauhinia Carroni	..	Brown Pegunny
Eucalyptus tereticornis ..	Blue Gum (Queensland) .. Forest Red Gum (N.S.W.)	Red Irongum
Eucalyptus propinqua ..	Grey Gum .. .. Small Fruited Grey Gum	Grey Irongum
Eucalyptus punctata ..	Grey Gum	Grey Irongum
Eucalyptus maculata ..	Spotted Gum .. .. Mottled Gum (N.S.W.) ..	Spotted Irongum
Eucalyptus citriodora ..	Citron Scented Gum (Rockhampton)	Lemon Irongum
Eucalyptus paniculata ..	Grey Ironbark .. .. White Ironbark (N.S.W.)	Grey Ironbark
Eucalyptus sideroxylon ..	Red Ironbark (N.S.W. and Queensland)	Red Ironbark
Eucalyptus siderophloia ..	Broad-leafed Ironbark (Brisbane and N.S.W.) Red Ironbark (N.S.W. and Queensland)	Red Ironbark
Eucalyptus melanophloia ..	Silver Leafed Ironbark ..	Silver Leafed Ironbark
Eucalyptus microcorys ..	Tallowwood (Q'land) .. Turpentine (Brisbane)	Tallowwood
Halfordia scleroxyla ..	Ghittoe (Atherton) ..	Saffronheart
Halfordia drupifera ..	Kerosene Wood (Fraser Is.)	Saffronheart
Maba humilis	Black Ebony (N. Q'land) ..	Queensland Ebony
Callistemon salignus ..	Willow Tea Tree ..	Brown Teawood
Geijera Muelleri ..	Green Heart .. .. Axe Gapper	Green Satinheart
Geijera salicifolia	Green Heart	Green Satinheart

SOME FACTORS THAT DETERMINE THE KEEPING QUALITY OF STORED MAIZE.

By F. F. COLEMAN, Officer in Charge, Seeds, Fertilisers, and Stock Foods Investigation Branch.

In 1923 a number of samples, representing maize then being imported from South Africa, were submitted for examination by the leading produce merchants.

The method of examination then adopted was to ascertain—

1. Weight of 1 litre in grammes.
2. Percentage of moisture.
3. Percentage of grain of the type to which the sample purported to belong.
4. Percentage of coloured grain.
5. Total percentage of commercial grain.
6. Percentage of damaged grain.
7. Percentage of foreign material.

At the time it was noted that most of the consignments consisted of Flint Maize, with a heavy volume weight. As this type is not usually grown in Queensland, no comparison can be made. Some of the samples of Yellow Dent, with more or less the characteristics of Queensland produce, were examined with the results as set out in Table A.

TABLE A.

YELLOW DENT MAIZE FROM SOUTH AFRICA (1923).

Sample No.	Litre Weight in Grammes.	Percentage of Moisture.	Percentage of Yellow Dent.	Percentage of Coloured Grain.	Total Percentage of Commercial Grain.	Percentage of Damaged Grain.	Percentage of Foreign Material.
74	710	14·6	95·959	2·166	98·125	1·715	·16
77	750	14·6	99·015	·415	99·43	None	·57
78	730	14·0	96·39	1·23	97·62	1·78	·6
80	722	12·7	94·189	·97	95·159	4·02	·821
96	726	12·4	93·76	4·62	98·38	·95	·67
97	761	14·0	95·61	2·295	97·905	1·57	·525
99	729	13·8	95·297	1·903	97·2	2·1	·7
100	743	14·0	93·472	4·505	97·977	1·64	·383
104	717	15·4	97·987	1·17	99·157	·583	·26
107	722	14·4	96·15	2·3	98·45	1·43	·12
138	702	11·6	95·49	None	95·49	3·23	1·28
139	705	11·0	93·75	2·74	96·49	2·61	·9
153	680	12·0	96·606	1·06	97·666	2·01	·324
154	701	12·0	98·497	·7	99·197	·4	·403
Average	721	13·3	..	..	97·731	1·717	·551

A portion of each of the samples was kept in air-tight glass jars; after a few months storage it was evident that factors other than the moisture content determined the keeping quality. All the samples put in the glass containers were free from external insects, and were such samples as would have then been accepted by the produce trade as free from weevils. The question therefore arose as to what methods, if any, that could be adopted, which, while not taking up too much time in the actual work of examination, would give results sufficient to indicate to the buyer, with some degree of accuracy, the samples' probable keeping quality.

Experiments in this direction had to be held over until the present laboratory was finished. With the heavy maize crop of 1924 we were able to obtain samples representing bulks from the principal South Queensland maize-growing areas, and a series of small experiments were made. It was soon evident that a low moisture content often indicated a low volume weight, with a large percentage of damaged grain.

In January, 1925, a more or less satisfactory method for the examination of the interior of the grain, to ascertain the number of insects in developmental stages had been worked out.

For the purpose of putting this tentative method to a test, fourteen samples representing South Queensland maize then offered for sale as suitable for export were examined in January with the results as shown in Table B. A portion of each sample was put into a glass jar closed with a screw-down lid; these containers were opened in February, April, and July, the condition of the sample then being as set out in the three columns on the right-hand side of Table B.

The remainder of each sample was treated in the following manner:—

1. Put in a screw-down glass jar with paradichlor. at the rate of 0·5 of a gramme to 1,000 c.c.
2. Dried for three hours at 50 degrees C, and then stored in a screw-down glass jar.
3. Fumigated for twenty-four hours with carbon bisulphide at the rate of 2 lb. per 1,000 cubic feet, and then stored in a screw-down glass jar.

In July and October the paradichlor. and dried samples were examined; all insects were dead, otherwise the condition of each sample was the same as when received in January.

In August the fourteen samples of maize fumigated with bisulphide of carbon for twenty-four hours at the rate of 2 lb. per 1,000 cubic feet were examined, with the results that ten were found to have kept well and free from live insects, four samples, however, were badly insect-infested. The four samples in question were fumigated in a bin fitted with a lid that would, in a produce merchant's warehouse, be accepted as air-tight. A careful examination of the bin revealed three small holes in the bottom, each less than one-sixteenth of an inch in diameter. After another experiment with the same bin it was definitely proved that the three small small perforations were the cause of the failure.

It is, therefore, obvious that under ordinary commercial conditions 2 lb. per 1,000 cubic feet would give a fair measure of protection, but could not be relied on to give a 100 per cent. kill.

Further experiments during the cold months of June and July with badly insect-infested maize proved that with temperatures below 65 degrees F, the effectiveness of fumigation by bisulphide of carbon, at the rate of 2 lb. per 1,000 cubic feet, was far less than the January experiments indicated.

The actual air space in a tank filled with maize is approximately 40 per cent. of the container's cubic capacity. Assuming our storage bin has a capacity of 1,000 cubic feet, it would hold nearly 20 tons of maize and 400 cubic feet of air.

TABLE B.

SAMPLES OF SOUTH QUEENSLAND MAIZE OFFERED FOR SALE AT BRISBANE DURING JANUARY, 1925.

Sample No.	Weight of 1 Litre in Grammes.	Percentage by Weight of Moisture.	Percentage by Weight of Apparently Good Commercial Grain.	Percentage by Weight of Damaged Grain.	Percentage by Weight of— Material that will pass $\frac{14}{64}$ Sieve.	Percentage by Weight of— Material other than Maize that will not pass $\frac{14}{64}$ Sieve.	Average Number of Live Weevils in one Pound of Sample	Interior Examination. Number of Insects in developmental stages found in one hundred kernels of the apparently good commercial grain.	Condition of Sample in— February. Sample Merchantable as—	Condition of Sample in— April. Sample Merchantable as—	Condition of Sample in— July. Sample Merchantable as—
498 ..	739·0	12·6	99·63	·28	·09	None	None	None	Sound	Sound	Sound
500 ..	729·8	13·6	98·57	·66	·77	None	Slight trace*	None	Sound	Sound	Slightly insect infested
486 ..	731·0	12·4	98·38	1·41	·21	None	4	10	Slightly insect infested	Insect infested	Badly insect infested
488 ..	736·8	12·3	98·41	1·44	·15	None	4	5	ditto	ditto	ditto
493 ..	701·3	13·2	98·14	1·27	·25	·34	None	9	Free from external insects	ditto	ditto
497 ..	725·8	13·1	99·4	·32	·28	None	4	7	Slightly insect infested	ditto	ditto
499 ..	747·4	14·6	99·15	·24	·61	None	None	12	Free from external insects	ditto	ditto
487 ..	710·9	12·8	96·38	3·51	·11	None	5	10	Slightly insect infested	Badly insect infested	Sample unsaleable
489 ..	727·7	14·0	96·55	3·08	·37	None	4	8	ditto	ditto	ditto
490 ..	712·3	13·7	96·49	3·10	·41	None	None	7	Free from external insects	ditto	ditto
492 ..	730·5	14·4	95·86	3·02	1·12	None	None	21	ditto	ditto	ditto
494 ..	709·4	13·9	98·76	·75	·42	·07	None	12	ditto	ditto	ditto
495 ..	705·7	12·7	98·43	1·27	·3	None	5	21	Slightly insect infested	ditto	ditto
496 ..	688·6	12·4	94·85	4·55	·6	None	14	11	Insect infested	Sample unsaleable	..
Average	721·1	13·2	97·78	7·77	..	..	..	..	..	..	..

* One live weevil found in 4 lb.

In actual commercial use it is doubtful if the user of bisulphide of carbon would have an absolutely air-tight container. The question, therefore, arises as to what concentration is necessary to give under ordinary working conditions a 100 per cent. kill in twenty-four hours.

Repeated experiments during September and October on maize that was badly insect-infested has proved that three pints (4½ lb.) of bisulphide of carbon applied to a full tank of 1,000 cubic feet capacity will give a maximum kill in twenty-four hours. If the grain remains longer in the container it may have an objectionable odour. After fumigation and before the grain is offered for sale, it should be put through an efficient cleaning machine to remove the dead insects. In all cases it is advisable to store maize in a container other than that in which it was fumigated. Further, it must not be overlooked that when the fumes of bisulphide of carbon are present in the fumigation chamber for a longer period than is absolutely necessary to kill the insects, the germination of the grain may be adversely affected. With grain stored for any length of time, the loss of germination from this cause will be particularly noticeable; when bisulphide of carbon is used in the manner recommended this loss will not occur. Owing to bisulphide of carbon, even in moderate concentration, being poisonous to man, its disagreeable odour, and danger of explosion when its vapour mixed with air is brought near a naked light, has caused many inquiries for a fumigant free from fire risks yet equally effective in killing power, with the result that attention has been directed to the use of ethyl acetate and carbon tetrachloride. In the U.S.A. this has been tried on wheat in railway box-trucks, using 40 volumes of ethyl acetate and 60 volumes of carbon tetrachloride at the rate of 45 lb. to 1,000 cubic feet.

Our experiments with these materials on maize are as set out in Table C, from which it will be noted that even at a greater concentration it failed to kill all the insects in the grain. If effective its present cost would be against its use; further, some of the grain after treatment had an unpleasant taste, which is also the chief objection to the use of paradichlor. in grain to be used for feeding purposes.

In theory carbon dioxide should kill all insects, yet experiments carried out in conjunction with the Agricultural Chemist, Mr. J. C. Brünnich, failed to kill the insects, in spite of the fact that a far greater concentration was used than would be possible under ordinary commercial conditions.

It is interesting to note that Barnes and Grove, in Vol. IV., No. 6, Chemical Series (Memoirs of the Department of Agriculture of India) under date of November, 1916, state that they were forced to the conclusion that no inert gas (such as carbon dioxide) can be economically used as an asphyxiating agent. Further, they found that as it affects the germinating power of wheat, they could only recommend the use of chemical deterrents or mechanical methods of treatment.

A series of experiments with a lighted candle in an air-tight container, also with carbon dioxide, proved the futility of these methods for the destruction of insects in stored maize.

Reference has already been made to the good keeping quality of maize that had been dried for three hours at a temperature of 50 degrees C (122 degrees F), the loss of weight at this temperature is reduced to a minimum, but the period of drying is too long for it to at present be a commercial success. Table D gives some experiments in drying at different temperatures. It is evident that time is required for the heat to reach the insects in developmental stages inside the grain.

TABLE C.

RESULTS OF FUMIGATION TESTS WITH ETHYL ACETATE, CARBON TETRACHLORIDE, PARADICHLOR., AND BISULPHIDE OF CARBON.

Fumigant.	Concentration of Fumigant per 1,000 cub. ft. of Chamber Space.	Duration of Fumigation.	Remarks on Insects at end of Fumigation.	Condition of Bulk at End of—	
				Two Months.	Three Months.
Forty volumes of Ethyl Acetate and fifty volumes of Carbon Tetrachloride	45 lb.	24 hours	Some killed, many alive	Insect infested	Unsaleable
Ditto	50 lb.	24 hours	Some killed, many alive	Insect infested	Unsaleable
Ditto	100 lb.	24 hours	Many killed, few alive	Insect infested	Badly insect infested
Ditto	50 lb.	48 hours	Many killed, few alive	Insect infested	Unsaleable
Bisulphide of Carbon	$4\frac{1}{2}$ lb. (3 pints)	24 hours	Dead	Insects dead, otherwise grain in same condition as when experiment started	Insects dead, otherwise grain in same condition as when experiment started
* Paradichlor.	10 lb.	Three months	Dead	Insects dead, otherwise grain in same condition as when experiment started	Insects dead, otherwise grain in same condition as when experiment started

* Grain after treatment with paradichlor. has an unpleasant taste and is therefore unsuitable for feeding to stock.

TABLE D.

Results of Experiments in the Drying of Insect-infested Maize at Different Temperatures.

Dried for—	½ hour at 57-60° C.	¾ hour at 58-59° C.	1 hour at 60° C.	1¼ hour at 58-60° C.	1½ hour at 60-61° C.	2 hours at 58-60° C.	2½ hours at 59-60° C.	3 hours at 60° C.
Remarks on insects at end of time dried	Alive ..	Alive ..	Alive ..	Alive ..	Alive	Alive	Trace of live insects, many dead	Dead
Condition of grain after two months storage	Unsaleable ..	Unsaleable ..	Unsaleable ..	Unsaleable ..	Unsaleable	Insect infested ..	Slightly insect infested	Insects dead, otherwise grain in same condition as when experiment started

Dried for—	18 min. at 77-80° C.	24 min. at 79-80° C.	30 min. at 80-82° C.	42 min. at 81-79° C.	54 min. at 75-81° C.	66 min. at 78-83° C.	78 min. at 78-83° C.	90 min. at 79-80° C.
Remarks on insects at end of time dried	Alive ..	Alive ..	Alive ..	Dead ..	Dead	Dead	Dead	Dead .. ..
Condition of grain after five months storage	Unsaleable ..	Unsaleable ..	Unsaleable ..	Insect infested	Insects dead, otherwise grain in same condition as when experiment started	Insects dead, otherwise grain in same condition as when experiment started	Insects dead, otherwise grain in same condition as when experiment started	Insects dead, otherwise grain in same condition as when experiment started

The temperatures given in this table are expressed in Centigrade. 60° C equals 140° Fahrenheit, 80° C equals 176° Fahrenheit.

Provided maize is free from insects inside the grain, it is evident from repeated experiments that a sample's resistance to insect attack has a relation to its degree of hardness. Samples dried for even a few hours at 40 degrees C usually keep in a merchantable condition for a longer period than the undried. This is borne out by the following small experiments:—In February, after drying 100 grains of sound maize at 39 degrees C for eighteen hours, forty live Calandra Oryzae were placed inside a jar containing the dried maize, the jar being covered with a piece of thin cloth. The adult insects were removed at intervals of a month; by November the total so removed had reached forty-nine. As a control the same number of weevils were placed in a jar containing 100 grains from the undried portion of the sample. At the same date in November a total of 137 had been removed, representing an increase of 97 in the maize as received, against an increase of 9 from the slightly dried maize.

It has further been observed that insect attack is far less on the flint-like grain usually found at the top and bottom of cobs than on the remainder of the grain. In all sub-tropical and tropical countries an immense loss is experienced each year by the working of the Rice Weevil (Calandra Oryzae) in stored maize, wheat, sorghum, &c.

This pest is often present in such numbers as to render it possible to collect kerosene tins full of the insects. When this has been done it is imperative that they be killed by boiling water or by fumigation with bisulphide of carbon. The pouring of cold water on the insects is useless, as the following small experiment will prove:—

In October 200 C. Oryzae were submerged in water for twenty-four hours and then put on filter paper in a petri dish. Within a few hours 170 had crawled under the filter paper, eighteen were dead, and twelve missing.

The live insects were then submerged for eight days; after being put on filter paper 113 crawled away, 51 were dead, and the remainder missing.

As far back as 1903 Mr. W. W. Froggatt, writing on insects that damage wheat or other foodstuffs, stated as a well-known fact that if clean grain be placed in a salt-bag no weevil will infest it. Since then it is understood that a process for the treating of bags with a saline solution has been patented by a resident of the Ayr district. From Table E it will be noted that the storage of maize in bags treated with a saline solution did not kill the insects in the grain or prevent them from breeding. It will, however, be observed that the use of treated bags, and double bags, gave a certain amount of protection from outside attack. Still we cannot overlook the fact that the only sample that retained its condition after five months' storage was the one fumigated with bisulphide of carbon, and stored in an air-tight insect-proof container.

In course of these experiments the bags of maize were stored in a rat and weevil infested shed; none of the salt-bags were attacked by rats. Easy access to untreated bags may have caused this; anyway, their dislike for the treated bags may be of some commercial value. Absolute immunity, however, could only be given by the storage of fumigated grain in a clean, dry, air-tight, and rat-proof container, and then only when the average moisture content of the grain was less than 14 per cent.

During the last few months several samples representing maize tanked during 1924 were submitted for examination. After more than a year has elapsed it is somewhat difficult to get full details of storage;

TABLE E.

EXPERIMENT IN THE STORAGE OF INSECT-INFESTED MAIZE IN AIR-TIGHT TANKS, DOUBLE BAGS, AND BAGS TREATED WITH A SALINE SOLUTION.

Fumigant.	Concentration of Fumigant per 1,000 cub. ft. of Chamber Space.	Duration of Fumigation.	Method of Storage.	Condition of Grain after Five Months' Storage.		
				Litre Weight in Grammes	Percentage of Sound Grain.	Condition of Bulk.
Bisulphide of Carbon ..	$4\frac{1}{2}$ lb. (3 pints)	48 hours	Air-tight tank	689·3	67·1	Insects dead, otherwise grain in same condition as when experiment started
Ditto	$4\frac{1}{2}$ lb. (3 pints)	48 hours	Bag treated with a saline solution ..	644·3	42·7	Insect infested
Ditto	$4\frac{1}{2}$ lb. (3 pints)	48 hours	Double bags, untreated	625·1	42·2	ditto
Ditto	$4\frac{1}{2}$ lb. (3 pints)	48 hours	Untreated bag	642·3	38·0	ditto
Nil	..	..	Bag treated with a saline solution ..	629·8	33·8	ditto
Nil	..	..	Grain sifted over a $\frac{14}{64}$-inch sieve, then put into a bag treated with a saline solution	605·3	27·0	ditto
Nil	..	..	Untreated bag	592·8	23·8	Badly insect infested

The above experiment was commenced during the third week of October, 1925, the condition of the Maize at the time being—Litre weight in grammes, 690·2; percentage of sound grain, 68; condition of bulk, insect infested.

it was, however, ascertained that two samples represented maize stored without any treatment, and three represented grain that had been fumigated and kept in specially constructed air-tight tanks. On a careful examination of the samples being made it was found that the samples of untreated maize were free from any trace of insect attack, therefore sound at time of storage. They had a slightly musty smell, probably caused by storage in tanks that had not been thoroughly cleaned out.

The samples representing bulks that had been treated with bisulphide of carbon were on dissection found to show traces of insects in developmental stages, which, however, had been killed in 1924 by fumigation. The maize was of good commercial quality, free from live insects, and sold at the highest ruling prices.

The actual difference in market value between good commercial grain and weevily samples may only be 3d. per bushel of 56 lb. or 10s. per ton, yet cases are on record of badly damaged samples that had lost over 20 per cent. of their original weight.

Two samples recently examined contained more than one-third of insect-damaged grain. The bulks in question would require over 110 bags to equal in weight 100 bags of the grain in its original condition. This involves double loss to the farmer without any advantage to the merchant handling the produce, besides being detrimental to the interests of the user.

Repeated experiments with grain in bulk have proved that when it is free from external insects, and from insects in developmental stages inside the grain, it can be kept indefinitely, provided it is not brought into contact with infestation of some kind such as may, more or less, always exist in barns, warehouses, or places where insect-infested grain has previously been stored.

Carbon bisulphide has been proved thoroughly effective and cheap in application. Provided the proper course is adopted there will be no retention of smell when the grain is subsequently marketed. The quantity recommended for maize is 3 pints (4½ lb.) per thousand cubic feet, it being always remembered that the quantity to be used has a relation to the cubic content of the container, which should be full of grain.

The insects infesting cow peas, beans, and sorghums can be killed in the same manner, the quantity, however, being reduced to 2 pints (3 lb.) per thousand cubic feet.

Insect-infested samples, and maize affected by *Diplodia Zeæ* (Ear Rot) are usually associated with a light volume weight, and in some cases with a low moisture content. On reference to Table B it will be observed that the average volume weight of a litre is given as 721 grammes, which is just under 58 lb. per imperial bushel. When the volume weight falls below 700 grammes (56 lb. per imperial bushel) it is a distinct indication of poor quality.

For the information of merchants and others sending maize samples to this branch of the Department of Agriculture it should be noted that samples should not be of less weight than 7 lb., care being taken to see that each sample is truly representative of the bulk.

Each sample should be marked in ink giving the following particulars:—

Quantity sample represents.

Date of sampling.

Full name and address of sender.

After examination the following particulars will be given:—

Volume weight of one litre.

Moisture content.

Percentage of apparently sound commercial grain.

Percentage of material other than maize.

Percentage of damaged grain.

Average number of live insects in 1 lb. of the sample (this does not include insects inside the grain).

The average number of live insects in developmental stages (found by dissection) inside 100 of the apparently sound kernels.

The fee payable by any produce merchant or other dealer for an examination of a maize sample will be one guinea, with a reduction when two or more samples are sent in at the same time.

EXPERIMENTAL WORK AT CHARTERS TOWERS.

The Director of Agriculture, Mr. H. C. Quodling, has received the following report from Mr. N. A. R. Pollock, Northern Instructor in Agriculture, Townsville:

A visit was made to Charters Towers in connection with the experimental and demonstration work in summer green feeds, and to arrange similar work with winter green feeds.

In approaching Charters Towers by train from Townsville, the diminution of the rainfall was noted from Ravenswood Junction in the quantity and quality of the pasturage, which became drier and scantier as the town is approached.

Since my last visit in early February when 2 inches of rain were recorded, there have only been a total of 36 points to date.

The few farmers who made any sowings met with failure, and with the exception of one (Messrs. Dutton and Watson, who got a little more rain than the others) there is not a farm with any crop showing.

On all farms the ground is ploughed in anticipation of rain, of which there is no present prospect.

Where irrigation is practised, sowing for winter crops can be carried on. The uncertain nature of the winter rains, however, clearly shows that the farmer should concentrate on the growth of summer crops, ensiling or drying these to carry him through the year.

Stock on Relief Country.

Stockowners are feeling the pinch and are casting about for relief country. Owners often at some distance from the rails have hung on in anticipation of rain, to find that their sheep are too poor to travel; others have railed and are railing their sheep to relief country in the Gulf districts and to the Eastern coast. At Reid River, which I visited on my return, agistment had been secured for something over 40,000 sheep which were then arriving; the loss by death during transit in one train was 5 per cent. Other trainloads of sheep are passing through for other coastal districts as far south as Mackay. These, I understand, are mainly wethers which will be distributed among sugar farmers and sold as soon as they fatten, the agreement being that the owner and farmer share equally in the value realised above 10s. per head.

At Cardington and Reid River grass and water were plentiful owing to the nice rains that had fallen. Crops of Sudan grass, velvet beans, and cow peas looked very well at Cardington, while at Reid River honey sorghum had won golden opinions.

PLATE 125.—SYDNEY SHOW CHAMPIONS.

These Poland-Chinas were all prize winners at the recent Sydney Show, the two, boar and sow, on the right, winning championships in keenly contested classes. The Poland-China has many very valuable qualities. It is a breed worth knowing, for they can be used to advantage both in the pure bred state and for crossbreeding for the production of pork and bacon. The Tamworth-Poland-China cross is an ideal type of animal.

PLATE 126.—PIGS FOR PROFIT.

The first prize winners in the Middle Yorkshire Sow and Litter Class at the recent Sydney Show. The class was keenly contested, several excellent quality litters being penned. Sows of this description, capable of producing large thrifty litters, justify the claim that there is "Money in Pigs." The litter, twelve in number, was shown in ideal condition, while the sow had been able to hold her own condition whilst suckling them.

THE CONSTRUCTION OF STIES AND PROVISION OF PADDOCK ACCOMMODATION FOR PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

This is the third of a series of articles dealing with the Construction of Pig Sties. The first and second of the series appeared in the February and April issues, respectively, and are now available gratis in pamphlet form.

The accompanying photographs illustrate an up-to-date "Commercial" Piggery with neat, useful, and attractive buildings. It is used principally as a fattening depôt for pigs fed on buttermilk (with the addition of some grain concentrate) secured on contract from the Boonah Butter Factory. This piggery was until recently owned by the late Mr. Fred Knuth, of Boonah.

It appeals as an ideal type of fattening depôt, a type of building to be recommended especially where buttermilk forms the principal portion of the liquid food. Plans of the building are available to anyone interested, and may be obtained on application to the Department of Agriculture and Stock, Brisbane. The main building (see Fig. 1) consists of one central fattening-house containing eight pens each 20 feet by 12 feet, with a 3 foot 6 inch passage through the centre. The building material required includes some thirty-six round upright posts, beams, cross-ties, and battens; the roof is of galvanised iron with ridge capping, spouting, &c. The pens are subdivided as required, the subdivision material being sawn hardwood rails and pickets ($1\frac{1}{2}$ inches apart) 3 feet 6 inches high. Wooden troughs have been used, for the owner found they were more satisfactory than concrete or brick and cement; they are 8 feet long by 12 or more inches across the top, and are made V-shaped. When placed in position under the subdivision rail facing the passage, there is just sufficient space allowed for the pigs to feed comfortably without standing or lying in the trough. The flooring is of bricks set in sand and top-dressed and grouted in with cement. This again has proved far more satisfactory than a concrete floor and has many other advantages apart from the convenience of handling in the first instance, principal among these advantages being that when and where required the floor can be repaired much more readily than in the case of a concrete floor. The brick floor is also much easier to clean; this is an important consideration where the water supply is limited.

For ordinary floor work, top-dressing and grouting, mix three parts clean, sharp sand with one part cement; make this into mortar of ordinary consistency, then to half a bucket of water add sufficient mortar to make the mixture thin enough to run freely into the joints between the bricks. It will be noticed that most builders prefer to have the bricks fairly wet before grouting. This would be done by the use of a watering-can using clean water; the objective of this is that the bricks already having absorbed some moisture will not absorb too much of the water from the grouting mixture before this has time to set. It is advisable to see that all the crevices between the bricks and especially in the corners are well filled with the grout before finally top-dressing with a mixture somewhat thicker than that already advised. If it is desired to make a specially good job of the floor use more cement, seeing in the first instance that the bricks are very firmly set in the sand.

In the piggery illustrated, the floor slopes outward from the centre of the building, and an open brick and cement drain outside conveys all waste water away from the buildings. Each pen is provided with a gateway, the gates being placed in such a position that they fill a useful part when pigs are being moved from one pen to another. The ridge pole is approximately 14 feet from ground level, the wall plates about 6 feet 6 inches.

Four thousand bricks were required in laying out the floor, drains, &c., and the builder estimated the cost of the buildings, tanks, &c., at £1,000, exclusive of cost of about one mile of 2-inch galvanised piping leading from the factory to the piggery; this latter was provided by the factory people. This may seem an expensive building, but when it is remembered that it provides accommodation for from 100 to 200 fattening pigs (according to size of pigs) and that it would be in use continuously year in year out for many years, the initial cost is not the only consideration.

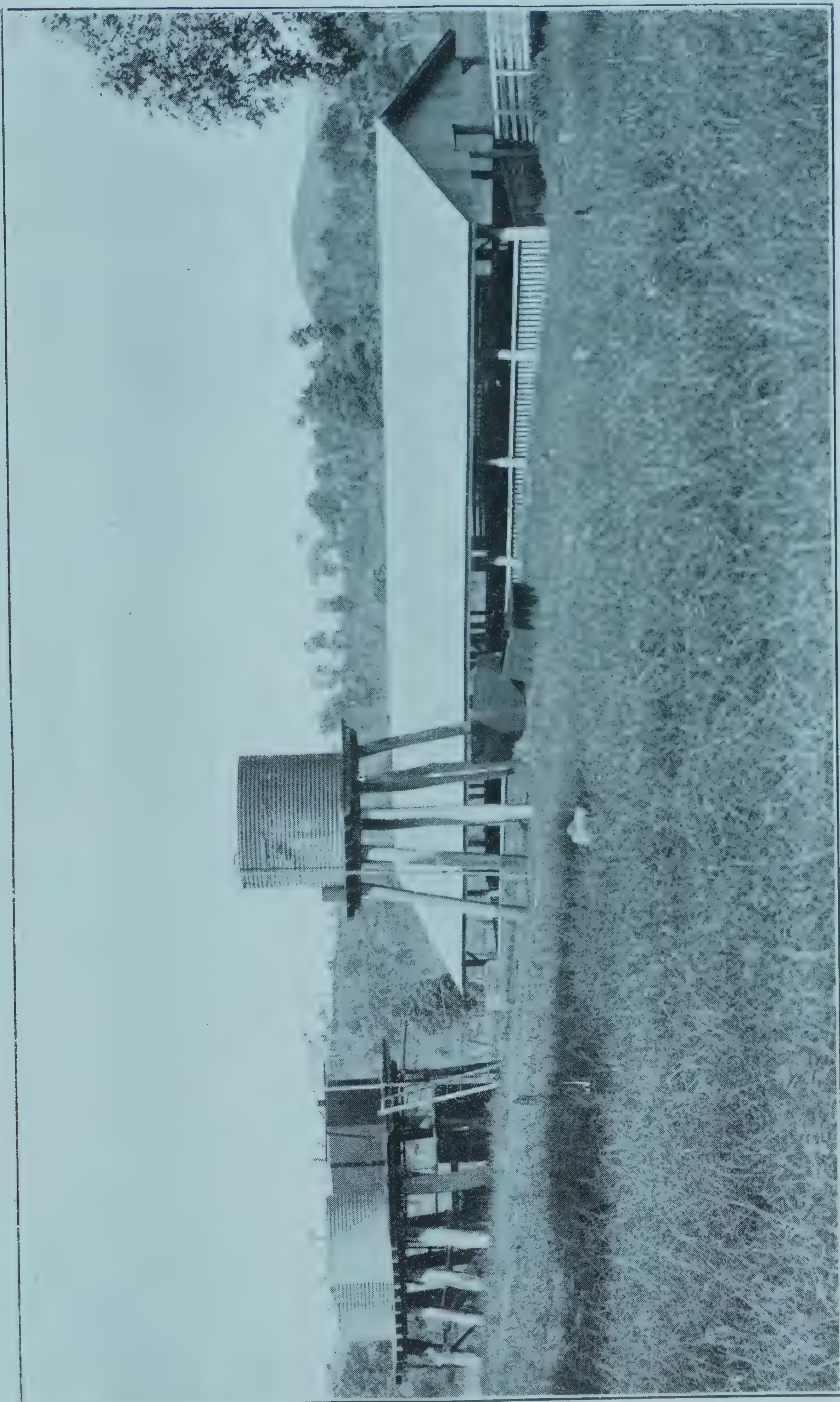


Plate 127 (Fig. 1.)—Pig-fattening Depôt, Property of Mr Fred Knuth, Boonah.

A neat, attractive, and convenient building.

The buttermilk is conveyed for a distance of about one mile across rising ground ex the factory through 2-inch galvanised piping to the receiving tanks, and through $1\frac{1}{2}$-inch piping ex the tanks to the pig troughs.

Very little trouble has been experienced with the 2-inch piping ex the factory to the receiving tanks, as it is regularly flushed out with 400 gallons of hot water immediately after the buttermilk supply to the pig tanks, and wash water to a field further on has been pumped through; but in the case of the $1\frac{1}{2}$-inch pipes leading from the receiving tanks to the pig trough, and which frequently carry a supply of milk for many hours at a time, considerable trouble has resulted, and it is considered that the lifetime of these pipes is but five years. Fig. 2 illustrates a batch of these pipes after five years use; they were riddled with holes, the result of the action of the acid in the milk on the pipes.

The question arises as to whether concrete piping or wood pipe would be preferable. The writer urges the use of properly constructed wood pipe for this purpose in preference to galvanised piping, for it is considered that it would be more economical and much more satisfactory for the conveyance of the milk from the factory to the piggery. It is not easy to secure concrete piping of 2-inch or of less diameter.

At the time the photographs were taken, Mr. Fred Knuth was proprietor; he had been working the property for eighteen years and reported very little trouble with his pigs from contagious or other diseases or from heat apoplexy or minor troubles.

The milk storage tanks comprise two sets; one of galvanised iron with a $1\frac{1}{2}$-inch concrete lining inside; the other set is of ordinary iron ship's tanks each of 400 gallons capacity. The large tank is used for the water supply; it also has a $1\frac{1}{2}$-inch inside lining of concrete. A permanent and sufficient water supply is an absolute necessity. In the illustration will be seen the loading race leading from the central passage and per means of which the pigs are driven from the pens to the wagon for delivery to the pig truck.

The directors of the Logan and Albert Co-operative Dairy at Beaudesert, Queensland, have recently erected a fattening depôt on practically the same plan as that illustrated. They have made improvement wherever necessary, and they are quite convinced that from a butter factory and from a pig-fattening standpoint buildings of this description are not only a necessity but a good business proposition. Receiving and resting yards outside of these pens, as well as convenient pig paddocks and cultivation areas, are also necessities, as also is a good food store in which grain and meals (pollard, &c.) can be stored.

Construction of Pig Sties—The Legal Aspect.

Several inquiries have been made recently as to the legal aspect of pig-raising and the construction of pigsties, i.e., "As to whether a pig farmer must be registered in a manner similar to that under which the registration of dairies and of dairy farmers is arranged; also as to the required distance from the dairy, cream room, &c., of the piggeries." To these the following information applies:—

There is at present no specific Act of Parliament applying directly to the registration of pig-raisers except the Act under which dairy farmers who keep pigs as part of their farm stock, but who are classified as dairy farmers, not pig farmers, are registered.

Certain shire and municipal regulations also prohibit the keeping of pigs within town boundaries, &c.

Under "*The Dairy Produce Act of* 1920," certain specified conditions must be observed in regard to distance of piggery from dairy.

In this connection attention is drawn to the following regulations:—

Regulations Nos. 57, 60, 62, and 64 of "*The Dairy Produce Act of* 1920" provide that—

> Regulation No. 57.—"No swine shall be kept on or be permitted to be or to approach or to remain within 150 feet of any dairy produce premises wherein dairy produce is handled, kept, or stored."
>
> Regulation No. 60.—"Should the construction or situation of or material used in any piggery or stable or the other conditions under which swine or any other domestic animals are kept or enclosed on dairy produce premises, be in the opinion of an inspector detrimental to the quality of the dairy produce obtained on such premises, the owner of such premises shall forthwith make such alteration as such inspector may by notice in writing require."
>
> Regulation No. 62.—"No accumulation of manure shall be permitted within 130 feet of a dairy house or any place wherein milk or its products are kept or stored or within 100 feet of a milking shed."

PLATE 128 (Fig. 2).—MR. FRED KNUTH'S PIGGERY.

Note the effect of the buttermilk on the galvanised piping in the foreground. These pipes had been in use but five years when they had to be replaced with new piping.

Regulation No. 64.—"All drains on any dairy produce premises where stock or pigs are kept shall be of an impervious nature, and shall be so constructed as to be capable of being kept in a clean and wholesome condition, and shall be controlled and directed as may be required by an inspector."

"The Slaughtering Act of 1898."

The Regulations under "*The Slaughtering Act of* 1898" which have reference to pig farmers and to pigs read as follows:—

Regulation No. 26 (*b*).—"No person shall feed or cause to be fed at any slaughter-house any swine with any blood or offal, unless such blood or offal has been boiled, desiccated, or otherwise treated to the satisfaction of an inspector."

Regulation No. 26 (*c*).—"No person shall remove or cause to be removed any blood or offal from any slaughter-house unless it has been previously boiled, desiccated, or otherwise treated to the satisfaction of an inspector."

How Swine May be Kept.

Regulation No. 33.—"The owner or occupier of a slaughter-house shall not keep, or cause or allow to be kept, any swine at such slaughter-house unless such swine are kept in accordance with the following provisions:—

(*a*) Such swine shall be confined either in a sty or paddock enclosed by a sufficient fence to prevent their egress or ingress at any part thereof when the doors or gates thereof are closed; and such doors or gates shall be kept closed except when in actual use by some person for the purpose of egress or ingress.

(*b*) No part of any such sty or paddock shall be less than 80 yards from any part of such slaughter-house in or at which stock are slaughtered or meat is dressed, prepared, treated, stored, or exposed for sale or delivery.

(*c*) Each sty shall have a roof, or each paddock shall contain a shed with a roof, and such sty or shed shall be large enough to cover from the weather all the swine kept at such sty or in such paddock.

(*d*) Each paddock, feeding-place, sty, or shelter-shed shall be kept in a clean and sanitary condition to the satisfaction of an inspector.

(*e*) Each feeding-place, sty, or shelter-shed or paddock shall be provided with drains sufficient to carry off thoroughly all drainage therein.

(*f*) Swine shall not be fed upon any floor except a floor constructed of concrete or other material impervious to moisture.

(*g*) No swine shall be fed, either wholly or in part, upon the flesh or blood of any diseased carcass or upon any food that has been mixed with or contains or has been exposed to contamination by the flesh or blood of any diseased carcass, or upon the flesh of an animal that has died other than by slaughter."

Regulation 37, dealing with fees for inspection of carcasses at slaughter-houses, provides in the case of pigs as follows:—

"The fees payable by the owner or occupier of a slaughter-house for the purpose of defraying the expenses of inspection shall be as follows, that is to say—For every head of swine slaughtered, 3d."

Regulation No. 53—"The Keeping of Swine"—reads as follows:—

"The owner or occupier of a butcher's shop shall not keep, or cause or allow to be kept, any swine at such butcher's shop, unless such swine are kept in accordance with the following provisions:—

(*a*) Such swine shall be confined either in a sty or paddock enclosed by a sufficient fence to prevent their egress or ingress at any part thereof when the doors or gates thereat are closed, and such doors or gates shall be kept closed except when in actual use by persons for the purpose of egress or ingress.

(*b*) No part of any sty or paddock shall be less than 80 yards from any part of such butcher's shop.

(*c*) Each sty shall have a roof, and each paddock in which swine are confined shall contain a shed with a roof; and such sty or shed shall be large enough to cover from the weather all the swine in such paddock or kept at such sty.

(*d*) Each paddock, feeding-place, sty, or shelter-shed shall be kept in a clean and sanitary condition.

(*e*) Each feeding-place, sty, or shelter-shed shall be provided with drains sufficient to carry off thoroughly all drainage therein.

(*f*) Swine shall not be fed upon any place except a place constructed of concrete or other material impervious to water and constructed upon a solid foundation.

(*g*) No swine shall be fed upon the flesh or blood of any diseased animal, or upon any food that has been mixed with or contains or has been exposed to contamination by flesh or blood of any diseased animal that has died other than by slaughter.''

Copies of ''*The Dairy Produce Act of* 1920'' and ''*The Slaughtering Act of* 1898,'' and any other information, may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1926 AND 1925, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1926.	Mar., 1925.
North Coast.	In.		In.	In.
Atherton	8·96	24	5·62	15·30
Cairns	18·09	43	6·81	28·07
Cardwell	16·27	53	7·62	23·92
Cooktown	15·33	49	4·85	28·08
Herberton	8·24	38	4·59	8·97
Ingham	15·74	33	8·77	24·13
Innisfail	26·16	44	17·42	43·04
Mossman	17·24	17	8·71	37·47
Townsville	7·72	54	1·78	7·36
Central Coast.				
Ayr	6·95	38	1·60	5·01
Bowen	5·78	54	2·84	5·11
Charters Towers ..	3·75	43	0·36	2·63
Mackay	12·13	54	6·98	14·87
Proserpine	11·66	22	9·96	19·62
St. Lawrence ...	5·80	54	2·26	2·23
South Coast.				
Biggenden	4·06	26	1·98	2·52
Bundaberg	5·38	42	2·83	5·70
Brisbane	5·75	75	1·93	9·26
Childers	4·87	30	1·74	3·73
Crohamhurst ...	11·67	30	4·87	18·41
Esk	4·85	38	2·56	7·49
Gayndah	3·23	54	1·43	1·57
Gympie	6·17	55	3·45	11·39
Caboolture	7·62	38	2·95	13·19
Kilkivan	3·98	46	1·03	3·03
Maryborough ...	6·23	53	3·41	6·90
South Coast—continued:	In.		In.	In.
Nambour	9·21	29	3·94	18·04
Nanango	3·36	43	1·54	2·97
Rockhampton ...	4·87	38	1·58	2·00
Woodford	7·99	38	2·12	14·67
Darling Downs.				
Dalby	2·71	55	3·44	2·89
Emu Vale	2·55	29	0·35	1·77
Jimbour	2·61	37	0·94	1·93
Miles	2·71	40	1·37	2·27
Stanthorpe ...	2·74	52	0·47	2·42
Toowoomba ...	3·87	53	0·79	4·66
Warwick	2·64	60	0·70	0·75
Maranoa.				
Roma	2·80	51	0·99	1·23
State Farms, &c.				
Bungeworgorai ...	1·77	11	1·38	1·35
Gatton College ...	3·34	26	2·33	3·15
Gindie	2·70	26	0·46	0·38
Hermitage ...	2·39	19	0·46	1·09
Kairi	8·28	10	7·70	12·93
Sugar Experiment Station, Mackay	10·95	28	9·36	14·68
Warren	2·69	11	2·03	1·96

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year, and for the same period of 1925, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

BREEDS OF PIGS—THE BERKSHIRE.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

Of the several breeds of pigs suited to the climatic conditions and to the environment of Queensland, none appear to be so popular or so widely distributed as the Old English Berkshire, also commonly known as the Berkshire, or more recently still as the Improved Berkshire. The type was named after the country in which it was originally developed and bred, and is considered to be the oldest of the improved breeds of pigs.

Historical records away back in the days of 1820 indicate that one, Lord Barrington, did much to improve this breed, which was at that time of a very much heavier and coarser type than is common nowadays. They were of a vari-coloured type—some were white, some quite black, whilst some were black and white with a large patch of white on the shoulder; some were rough-coated, others fine; and they were not noted for any special characteristics.

Herbert Humphrey was a very successful breeder of the type in 1862, the year when the breed was first given a special class at agricultural shows, and he was the chief mover in establishing the British Berkshire Society. For over twenty years he compiled the Herd Book and edited its proceedings. Since then breed societies, like the show yard, have exercised a stronger influence on type and quality than any other institution.

Berkshires are undoubtedly the most popular and the most suitable of the dual-purpose types. They were among the first to be improved and, seeing that they are suited not only to the cooler weather conditions prevailing in England, Europe, and America, but to the warmer climates of Africa, the Islands, and Australia, they rapidly become acclimatised and may be adapted to almost any conditions.

The breed possesses a ready aptitude to fatten, either as porkers or baconers, and can be killed to advantage from 4½ to 6 or 7 months old, the 6-months-old pigs being the most profitable. It costs more to feed them after they scale 130 lb. dressed, and the bacon-curers class them in a lower grade if too coarse or too heavy.

The Quality of Berkshire Pork and Bacon.

The average quality of Berkshire pork and bacon is such that it can be graded as extra prime. The fat and lean meat are fairly intermixed and of excellent quality. The pigs dress out well in proportion to their live weight. The large and lengthy framed Berkshire with a medium to short head and a fine coat of hair is much sought after. These are noted for early maturity, quick growth, and for prolificacy—three very desirable characteristics in any breed of pig.

The report of the British Berkshire Society states that the chief characteristics of the breed are their hardiness, active disposition, general conformation, and their evenly developed carcass, whilst as a breed they are unsurpassed as grazers and foragers. As a result of their strong digestive and assimilative powers their increase in weight is large in proportion to the amount of food consumed.

Their Early History.

It is recognised, of course, that Chinese, Neapolitan, and perhaps also Siamese pigs were used for mating with the Old English wild pig to form the foundation of the new type, and doubtless the prepotency of the Old Chinese type (which was white) has been handed down through the ages of improvement. The older types of Berkshire, as illustrated in a very old oil painting in possession of the Agricultural Department of the University of Edinburgh, shows the breed as of a chestnut colour with dark patches through the hair. Russet-coloured spots were common, and these still appear in Berkshires that show a tendency to degenerate. The colour comes out very strongly in second and third crosses of these types. In America they have a Red Berkshire, a type evidently evolved from this Old English russet-coloured strain with possibly additional Tamworth crosses.

The journal called "The Complete Grazier," in an issue of 1845, describes the breed after it had been materially improved from the standard of the earlier days, as in colour reddish-brown, with brown or black spots, sides very broad, legs flat, ears large and pendulous over eyes, body thick, close, and well made.

The Modern or Improved Type of Berkshire.

There can be no denying the fact that the Berkshire has undergone more changes in type under the influence of the showyard in recent years than any other breed of pig which has been recognised in prize schedules for an equal length of time. There

Plate 129 (Fig. 1). A Group of Selected Berkshire Brood Sows.

never was a time when quality and type were more keenly sought after and obtained by the breeder than now. There is no call nowadays for the long-nosed, rough-coated type of years ago.

Prominent amongst the characteristics for which the Berkshire is noted are:—

(1) Great muscular power and vitality, which renders them less liable to disease than any other breed. The boars are prepotent to a degree; the sows are fairly prolific.

(2) Activity, combined with strong digestive and assimilative powers; hence Berkshires return a maximum of flesh and fat for the food they consume. They are good "doers."

(3) The sows are careful nurses and good sucklers, and all are excellent grazers. They possess good limbs, and good-quality, fine, flat bone.

(4) The young pigs are strong, smart, and active at birth, consequently are less liable to mishap.

(5) They can be fattened for market at any time, whilst they can be fed to any reasonable weight desired.

(6) The flesh provides a high-quality pork and bacon much sought after, both by pork-buyers and bacon-curers.

(7) The Berkshire boar possesses remarkable powers in transmitting the valuable qualities of the breed to his progeny when used as a cross. This power is called "prepotency." No breed has been used more extensively for cross-breeding purposes or has been found so useful for refining the progeny of coarser types.

(8) Berkshires possess unsurpassed uniformity in colour markings and quality. They reproduce themselves faithfully. Their reasonable size, quick growth, and easy fattening powers, with uniformity and hardiness, make them a favourite with breeders of pigs generally.

The Modern Type.

The modern—or, as it is frequently erroneously styled, the "improved" Berkshire —is medium in size, trim, and free from roughness. They are well modelled and possess the very necessary length and depth of body and hams. The face is short and dished, the ears fine and erect and slightly pointed; the hair thick and fine, according to type, without "swirls" or "roses" (both faults in the showyard). To the pig fancier the modern Berkshire has a captivating and symmetrical outline.

When slaughtered, Berkshire flesh has a fine texture with the proper proportion of fat and lean. The meat is sweet and of good flavour. This is the result of quick growth and early maturity.

Both boars and sows have an excellent disposition; they are quiet, docile, and contented, and it is uncommon to find a bad-tempered fence-breaker amongst them.

The breed is fairly prolific under local conditions, and this characteristic can be distinctly improved by careful selection and breeding. In-and-in breeding, breeding too closely, and neglect soon tell their tale in reduced and irregular breeding powers. This also lowers the standard of quality and causes the animals to be classed as "slow growers."

Both the fine- and the thick-haired types do well here. The former or a medium type is the more popular. We see very little of the thick-haired types nowadays, for they are not as attractive nor as symmetrical as the medium-coated "improved" Berkshire.

The Breed Societies.

Following on after the formation of the British Berkshire Society in 1845, the American Berkshire Association was organised in 1875 and the National Berkshire Record in 1893. It was during the year 1900 that the Berkshire and Yorkshire Society of Australasia was organised, and this society grew to such dimensions that in later years it became necessary to reorganise the parent body. This has now been completed, the new organisation being styled "The Australian Stud Pig Breeders' Society," with headquarters in Melbourne and with branches in the various States. The Queensland branch secretary is Mr. R. G. Watson, of Inns of Court, Adelaide street, Brisbane, from whom can be obtained a beautifully illustrated brochure entitled "Better Pigs on Every Farm," in which the organisation and development of the society is also referred to.

These societies have done much for the Berkshire and for the other breeds registered in their herdbooks, and it has been the means of organising the distribution of the various breeds to the four corners of the Commonwealth. To-day in Australia

PLATE 130 (Fig. 2).—A CHAMPION PRIZE-WINNING BERKSHIRE BOAR—"GOOMALIBEE COLONEL."
Note his depth and compactness together with evenness and neat attractive appearance.

Berkshires stand at the head of the list as being most readily adapted to any climate, soil, or condition; they will reproduce with equal facility and quality both for pork and bacon.

The Berkshire as a Breeder.

The Berkshire sow makes an excellent, contented mother—sturdy, vigorous, and thrifty, cleanly in habit (if given a chance to be so), fairly prolific, averaging from 8 to 10 pigs reared per litter. The suckers when born are lively, sturdy, keen, and develop rapidly.

Sows should not be retained as breeders when over seven or eight years of age, as they lose their teeth and often become very clumsy and poor sucklers. They can, of course, be fattened and marketed as back-fatters if food is reasonably cheap and plentiful.

If the stock are too finely bred, however, they deteriorate and produce puny litters. The breed exercises a powerful influence in the production of good-typed pigs in country districts. Cross-breeding can thus, by the maintenance of pure, strong, prepotent types, be made of considerable local value.

Berkshire Boars.

Some very high prices have been secured for Berkshire boars abroad. We have record of a genuine Canadian sale of the Berkshire boar "Premier Longfellow," who was champion at St. Louis State Fair in 1916, and at the sales realised £400. The record price in England is £500, whilst Berkshire sows have also topped the sales on many occasions. Stud pigs have never realised these prices in Australasia, but from 50 to 75 guineas each has been paid on several occasions in New South Wales and Victoria for selected animals.

A few years ago it was considered that the Berkshire was much superior to any other breed in prolificacy, but many breeders, taking advantage of the opportunities at auction sales of stud pigs and in show rings, have followed a system of excessively fattening their animals. This has in some instances resulted in a loss of refinement and quality in the young stock, and a still more serious defect in the loss of hereditary prepotency.

It has been truly said that the "pig is what the breeder and feeder make it."

The showyard winner of to-day is, unfortunately, often a short, chubby, unprofitable animal with an unnatural obesity, thick heavy forequarters, and poor breeding powers.

BERKSHIRE PIGS—THEIR SUPERIOR QUALITIES.

The British Berkshire Society, in whose herd books British Berkshire breeders have for many years past registered their stud animals, has recently been engaged in a progressive movement aiming at popularising this famous old breed amongst the men engaged in pig raising the world over. Some of the special characteristics which they bring under the notice of breeders are as follows, and Berkshire breeders in Queensland would do well to note these several points and use them in advertising their stock:—

BERKSHIRES

"Make more meat from meal than any other breed."

"They are hardy, docile, and exceptionally good mothers."

"They cross well with the best breeds, and improve the quality of the coarser ones."

"They thrive in climates as widely divergent as those of India and Canada."

"They obtain a premium from the leading bacon curers."

"They have won the Championship and Reserve Championship over all breeds in all carcase classes at Smithfield Show since their inauguration in 1904."

"They have won the Championships for the Best Pair of Pigs nineteen times (no other breed has won this more than three times)."

"They have won the Championship for the Best Single Pig nineteen times (no other breed has won this more than five times) at the thirty-seven Smithfield Shows since 1883."

"They have won the Whitley Challenge Cup for the Best Bacon Breed at the London Dairy Show. This record is unrivalled in the history of British live stock."

"The reason is: They yield more weight for age and a higher proportion of lean to fat, for a given weight, than any other breed."

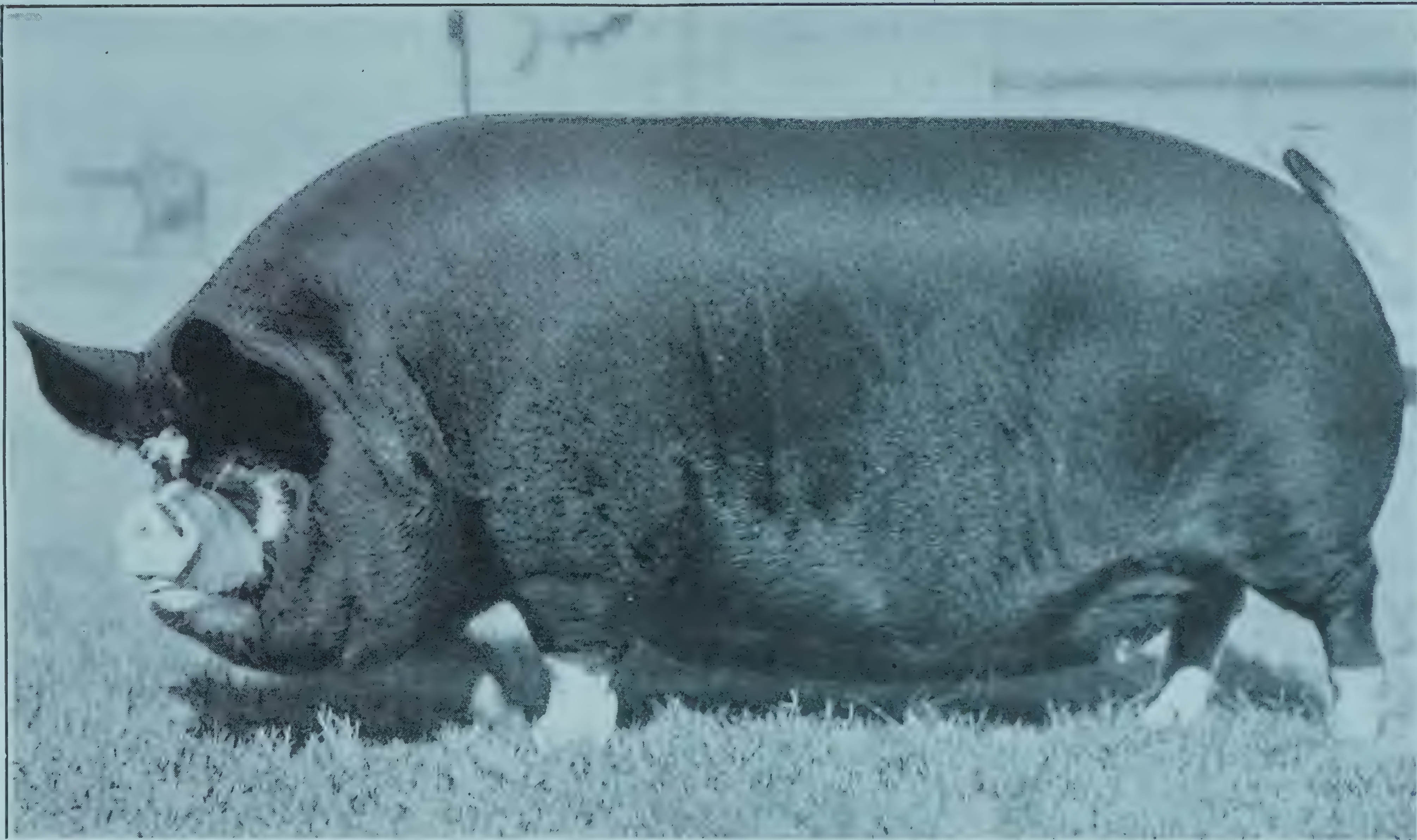


PLATE 131 (Fig. 3).—A VICTORIAN-BRED BERKSHIRE SOW, "TOPSY OF YARRA" 3702.
Her progeny have been consistent prize-winners. She also won many prizes at Victorian and New South Wales Shows. She represents the best we have in this breed.

BERKSHIRES FOR PORK AND BACON.

In an interesting and informative pamphlet entitled "Berkshires for Pork and Bacon," issued under the auspices of the British Berkshire Society, the following records of the Berkshire breed appear. We make these excerpts for the benefit of breeders generally:—

1. The Record of the Berkshire Breed.

After being cultivated with increasing carefulness by individual breeders for more than one hundred years, Berkshires were the earliest registered of any breed of pigs in England, and they have been consistently developed with strict reference to commercial requirements ever since. To this is due the wonderful record of the Berkshire breed—a record unrivalled in the history of British live stock.

2. The Performance of the Berkshire Breed at the Smithfield Show (Carcase Classes).

Smithfield is the leading Fat Stock Show of the world, and the two judges in the carcase classes who are appointed from among expert butchers and curers—one from London and the other from the provinces—are changed every year. A third expert butcher or curer judges the Carcase Championship.

Since the Championship was inaugurated in 1904 up to 1923, both the Championship and Reserve Championship over all breeds have been won every year with only one exception by purebred Berkshires.

The following table shows the numbers of first prizes won by purebred Berkshires and their crosses and by other breeds and crosses since the inauguration of the carcase classes:—

Class.	Berkshires.	Berkshire Crosses.	Total Berkshires and B. Crosses.	Other Breeds and Crosses.
1 pig not over 100 lb. live weight ..	15	1	16	3
1 pig not over 6 months above 100 lb. not over 200 lb. live weight ..	18	1	19	nil
1 pig not over 9 months above 200 lb. not over 300 lb. live weight ..	14	2	16	3
1 pig over 160 lb. not over 240 lb. live weight, best for bacon, since 1910	10	1	11	1

3. The Percentage of Live Weight to Dead Weight of the Berkshire Breed.

The following table, compiled at Cambridge University for the "Journal of Agricultural Science," giving the comparative percentage of meat for pigs of different ages exhibited and slaughtered at Smithfield, shows the marked superiority of Berkshires over other breeds for both pork and bacon:—

	3 months.	5 months.	7 months.
Berkshires	77.0	78.7	81.1
Middle Whites ..	73.0	76.8	82.4
Large Whites ..	73.0	76.9	80.9
Large Blacks ..	72.9	73.9	79.7

It is to its superior fleshing capacity, combined with a higher proportion of lean to fat at the early age requisite for tender meat, that the pre-eminence of the Berkshire breed in the carcase classes is due, not only at Smithfield, but wherever they are shown in competition with other breeds.

4. The Performance of the Berkshire Breed at the Smithfield Show (Live Classes).

At Smithfield there are also classes for live pigs of every recognised breed, a challenge cup being awarded for the best single pig and a supreme champion prize for the best pen of two pigs.

The challenge cup for the best single pig of all breeds from 1888 to 1923 (thirty-three shows) has been awarded to—

Berkshires	19 times
Berkshire crosses	1 time
All other breeds and crosses	13 times

The championship for the best pen of two pigs of all breeds from 1883 to 1923 (thirty-eight shows) has been awarded to—

Berkshires	19 times
Berkshire crosses	7 times
Total	26
All other breeds and crosses, total	12 times

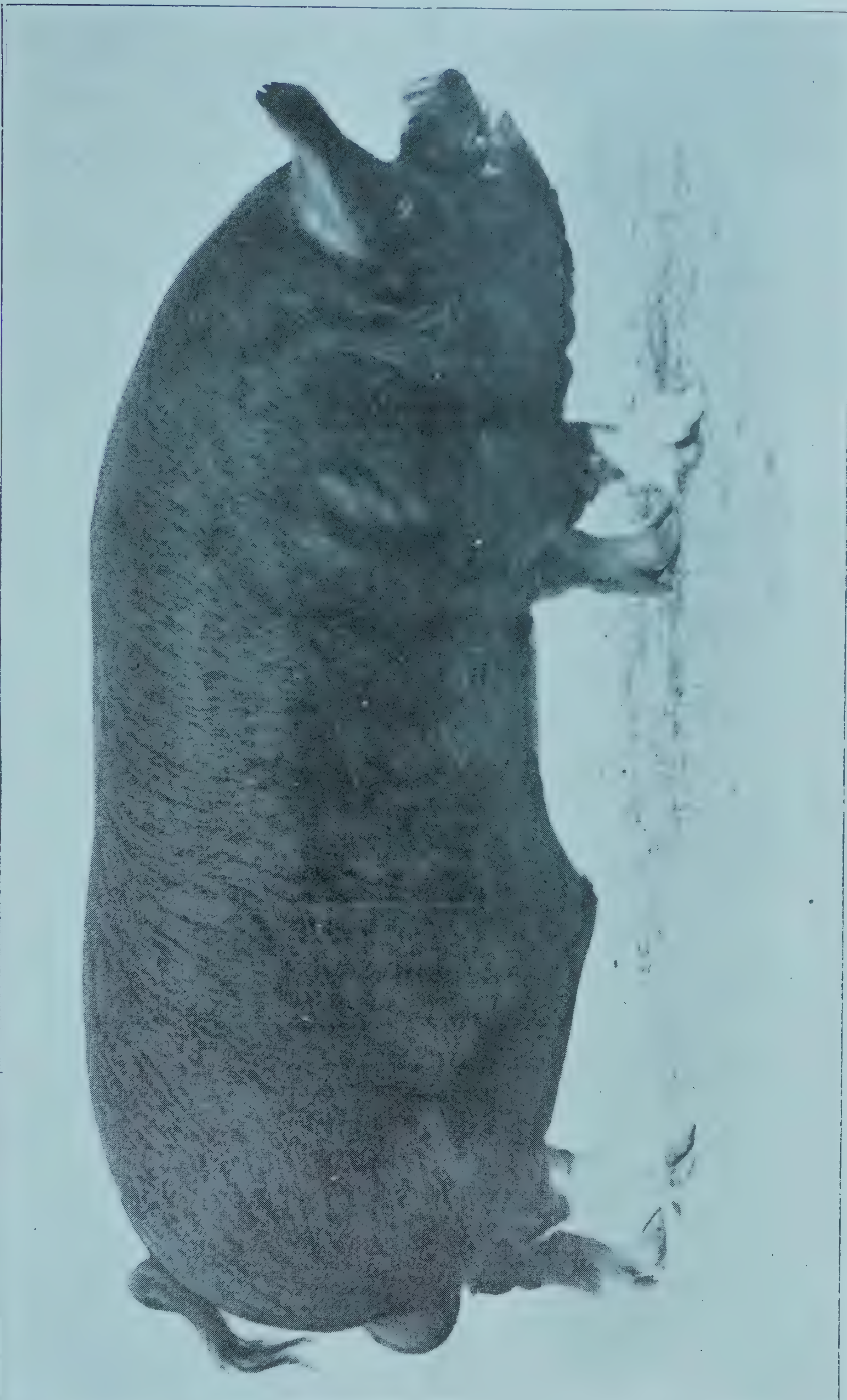


PLATE 132 (Fig. 4).—BERKSHIRE BOAR "WILCANNIA SPECIAL" (3709).

Property of Mrs. E. M. Lennie, a noted Victorian breeder. This boar has a wonderful prize record, and his progeny have a record of which any stud breeder might well be proud. His markings are characteristic of the breed, while he is of excellent type and conformation.

5. The Performance of the Berkshire Breed at the London Dairy Show.

The "Whitley" Cup has been awarded annually since 1921 for the best bacon breed. The entries, which are made only by breed societies, consist of six pigs of any pure breed, dressed and cured, and are judged on advertised points.

The British Berkshire Society won in 1923 with a total of 85 points out of a possible 100.

Winners in 1924, the British Berkshire Society, with a maximum total of 100 points. Reserve, Wessex Saddleback Pig Society, 92 per cent.

Subjoined is the actual score:—

	Correct proportion of cuts or joints including thickness of streaky.	Suitability of side, quality of meat, bone, &c.	Fat on back, lean meat, proportion fat and lean.	Firmness of Fat.	Firmness of Rind.	Deduction for seedy-cut.
Possible points ..	30	20	30	15	5	15
Berkshires actual ..	30	20	30	15	5	nil
Reserve No. awarded	28	18	28	14	4	nil

DETAILS OF CARCASES.

Age.	Live weight.	Dead weight.	Bacon weight.	Loss from live to dead weight.	Loss fr m live to bacon weight.
	lb.	lb.	lb.	per cent.	per cent.
Berkshires, 6 months 21 days ..	1,154	914	707	20.7	38.7
Reserve No., 6 months 18 days	1,258	993	519	21.0	40.3

No other breed in this class showed a loss from live to dead weight less than 20.7 per cent., or a loss from live to bacon weight less than 40.3 per cent.

The C. and T. Harris (Calne) Challenge Cup awarded to the exhibitor of the four best sides of Wiltshire bacon in the three pedigree or first-cross bacon carcase classes (first awarded in 1924). Winner, the British Berkshire Society, with purebred Berkshires.

(Extract from "The British Berkshire Annual," 1925, p. 29.)

6. The Berkshire Pig Abroad.

In the Argentine, Australia, and New Zealand—countries in which the commercial aspects of live stock breeding are alone of importance and where the most up-to-date methods are exclusively employed—Berkshires constitute two-thirds of the purebred pig population, which is a striking tribute to the suitability of the breed for all climates and conditions.

This fact assumes particular significance in the case of Australia and New Zealand, where bacon production is a large and growing industry.

In South Africa and Canada they are second in order of popularity, and they thrive in increasing numbers in Japan, India, the Malay States, and Central Europe.

In the United States of America, Berkshires have long had their own breed society. At the International Live Stock Show at Chicago, held annually, Berkshires have sired thirty champions, and have won first prize in one or more classes nineteen out of twenty-one years—a record unequalled by any other breed.

Since the war the demand for Berkshires for export to all parts of the world has steadily increased.

7. The Superiority of the Berkshire Cross for Bacon.

All independent experimental research for ascertaining the best cross for bacon shows that one or other parent—and preferably the dam—should always be a Berkshire.

For Wiltshire bacon, which commands the highest price in the world, the Western Curers' Association, in their leaflet, "Pigs for Bacon," say, "To produce at the greatest profit the best pigs for prime quality lean bacon, the farmer is recommended to breed his pigs from large white boars and pure Berkshire sows."

The experiments of the Canadian Government at Scott, Saskatchewan, which have been conducted under the supervision of a committee of curers, have reached the same conclusion, viz., that the large white boar on the Berkshire sow is a better cross for bacon than any other breed or cross.

PLATE 133 (Fig. 5).—BERKSHIRE BOAR, "MURRAY GLEN STAR" 1969.

This Boar, the property of Queensland Agricultural High School and College, won championships both at Brisbane and Sydney Shows. He comes from a long line of prize-winning Berkshires. His sire, "Murray Glen Longfellow" 3681, sired many champions. Murray Glen Star's progeny have been in great request by Queensland breeders.

The Conformation of the Berkshire—"Standard of Excellence."

How closely the type to which the Berkshire has been bred corresponds with the requirements of the bacon curer may be seen by setting out in parallel columns the standard of excellence of the British Berkshire Society and the specification of the curers at a recent conference at the Ministry of Agriculture called for the purpose of ascertaining their requirements—

The Curer's Specification.	*The Berkshire Standard of Excellence.*
Back—Long and level, with ribs well sprung.	Long and level, with ribs well sprung.
Sides—Level and moderately deep.	Level and deep; free from wrinkles.
Hams—Broad, wide and deep to hock; tail set high.	Broad, wide and deep to hock; tail set high and fairly large.
Belly and Flank—Thick, with straight underline.	Thick, with straight underline.
Shoulders—Light, and on a line with forelegs below and with sides laterally free from wrinkles and coarseness.	Light and aligned with forelegs below and with sides laterally, well sloped backwards; free from wrinkles and coarseness.
Flank—Aligned with the sides.	Aligned with sides; should handle firm.
Head, Neck, and Jowl—Light.	Moderately short, face dished, snout broad, wide between the eyes and ears; ears fairly large, carried erect or slightly inclined forward and fringed with fine hair; jowl, light; neck, light and evenly set on shoulders.
Legs—Short, and set wide apart; the pig should stand well up on the tips of the toes.	Short, straight, and strong, set wide apart, and hoofs nearly erect.
Bone—Fine.	Fine.
Flesh—Firm, without excessive fat.	Firm, without excessive fat.
Skin—Free from coarseness and wrinkles.	Fine and free from wrinkles.
Hair—Fine.	Long, fine, and plentiful.

SOME INTERESTING LITTER RECORDS.

The statement that "Berkshires do not farrow enough pigs," a statement that has been often made in Queensland, in the other States, and abroad, has recently been challenged by the Berkshire breeders of America through their secretary, E. M. Christen, an authority on the breed, and an official who has done a great deal of research work over a long series of years.

When asked why this statement had been made, on the occasion of a chat to a prominent Berkshire breeder recently, the answer was short and not altogether satisfactory for, said the breeder referred to, "I don't know, but that is what people tell me." Now many pig breeders in the Northern State have said the same thing to the writer in the course of the past twelve months, and there seems to be a general impression that the Berkshire is not as prolific as it ought to be.

Observation had, however, taught Secretary Christen that these remarks were not true, because he had seen as many "producing" Berkshires as any other breed in the course of a five years' special study of this type. The ability of the Berkshire sow to produce a sufficient number of pigs was unquestioned in his mind. "Now," said he, "what was the evidence which could be presented to even a biased mind, which would convince him that average Berkshire sows not only farrow as many pigs as any other breed, but that they also rear as many?"

So attention has been turned to the statistics as contained in the first 1,400 litters recorded in volume 63 of the "American Berkshire Record." This survey brought the data strictly up to date, as the 1,400th litter was entered on 2nd July, 1924. This record of 1,400 litters does not include duplicates such as litter mates. The 1,400 litters showed a total of 12,309 pigs farrowed, or an average of 8.792 pigs to the litter. This is as good or better than the other breeds do, and considerably better than averages on farms where purebreds only are used.

Of the 12,309 pigs farrowed in these 1,400 litters, 9,803 of them were reared. This makes an average of 7.002 pigs reared per litter, which is well within the probabilities of a net return from the brood sow even now.

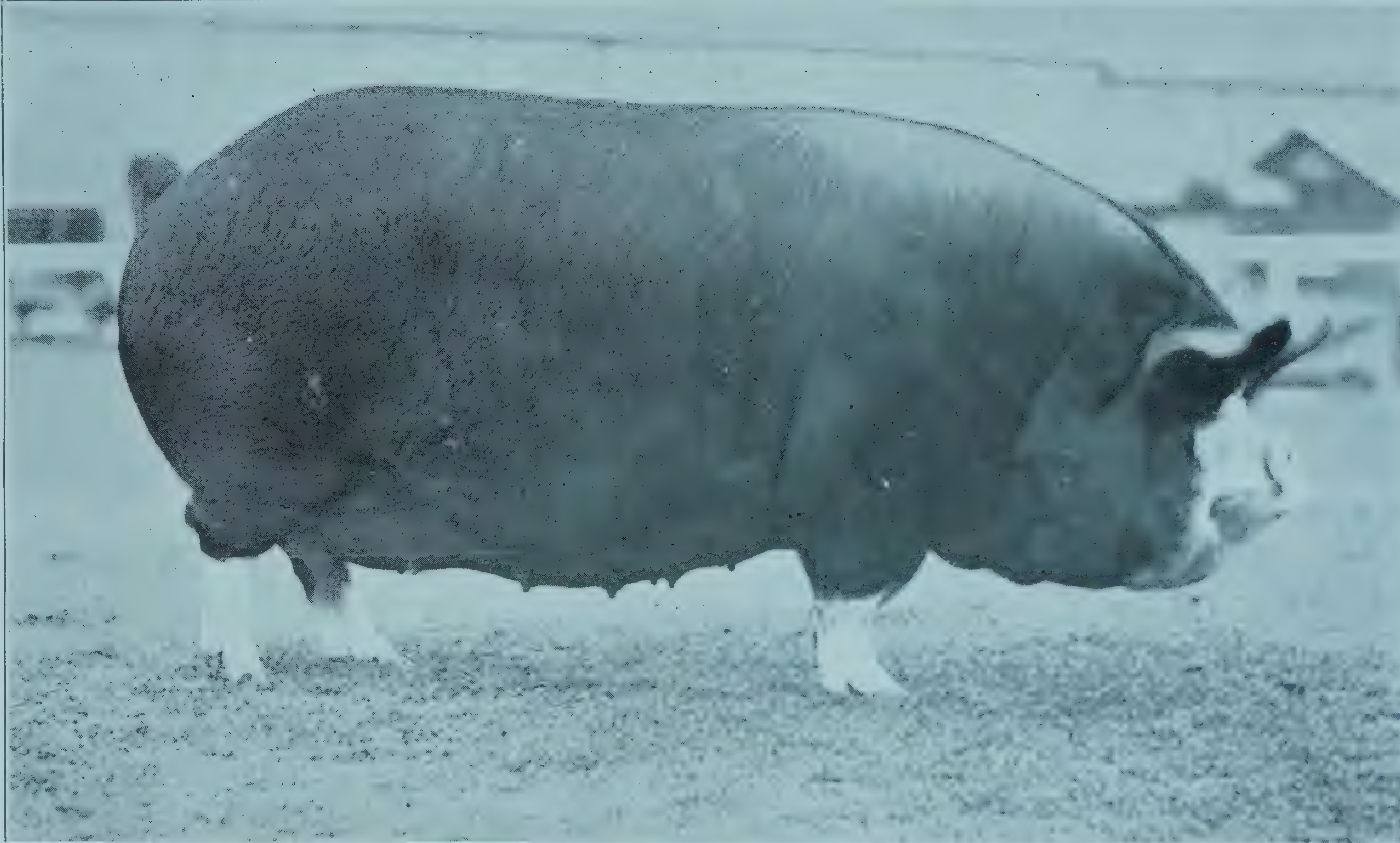


PLATE 134 (Fig. 6).—BERKSHIRE SOW "BRENTWOOD AMY" (5561).

Champion Berkshire Sow, Sydney Show, 1926. Property of G. A. Bedwell, a noted Victorian breeder. She also comes from a well known prize-winning family. Her markings are not as true to Herd Book standards as is desirable, but she has good body development, a soft mellow skin and fine silky hair.

When one considers that these litters were farrowed and the records came from every State of the Union, from every age of sow, farrowed in every season of the year, and under every condition, we can accept them as authentic and without hesitation. One of the tasks of Berkshire breeders is to see that this information passes into the hands of men who do not know about the breed.

A Berkshire sow, or any sow to be profitable, must farrow a reasonable sized litter, and then rear them. It is true many pigs are lost before weaning time because of carelessness of the owner, improper management, or wrong feeding. The sow is nearly always charged with this loss, whether it is her fault or not, especially by the sceptic who does not know, nor desire to find, the truth. Breeders must present facts to counteract this.

At the same time we must not bind ourselves to the fact that certain sows or certain families do not produce as large litters as others. When such an animal is found the sow should be sold for pork. It is reasonable to expect the pigs in a small litter to be plumper and more attractive looking than those in litters of seven, eight, or ten. They ought to be, but there is no reason why they should be retained on the farm. The breeder must ask himself, and answer the question—"If the sow or boar in the big litter had had the same chance, would she or he be as good as the pig before us from a small litter?"

This has not been done in the past, and our selection of breeders has been largely a selection without respect to breeding, ancestry, or the chance the pig has actually had. Many simply select the best looking pigs. This is shown by the fact that practically every pig in litters of three, four, or five were all reared and (in the case of the American Herd Book referred to) were all registered, while it was seldom that more than four pigs were ever registered from a large litter.

It was also noticed that the litters in some herds ran uniformly large in size, while in others they were uniformly small. This goes to show that selection or care, or both, affect the number of pigs farrowed and reared.

A summary of the 1,400 litters mentioned above shows—

9	Litters	of	3	pigs	each
19	"	"	4	"	"
46	"	"	5	"	"
99	"	"	6	"	"
177	"	"	7	"	"
282	"	"	8	"	"
294	"	"	9	"	"
215	"	"	10	"	"
130	"	"	11	"	"
61	"	"	12	"	"
42	"	"	13	"	"
12	"	"	14	"	"
11	"	"	15	"	"
2	"	"	16	"	"
1	"	"	17	"	"

Total 1,400 with a total of 12,309 pigs farrowed and an average of 8.792 pigs to the litter.

In conclusion, we can say, and should say, that Berkshires are prolific and use the above-quoted authentic figures to show it. Also, that these Berkshire sows are good mothers, as they reared over seven pigs to the litter, or, to be exact, 9,803 pigs in the 1,400 litters. These figures come without any omission, with no effort to find a favourable record, but as a clean, short presentation as to what an average Berkshire sow will do and can be expected to do.

It is unfortunate that up to the present our Australian Stud Pig Breeders' Society Herd Books have published no record of the litters produced by the sows whose breeding has been recorded in these stud records.

Now, however, that it has become necessary for breeders to notify the secretary of the society in the State in which they reside as to the farrowing records of the stud sows and to give exact records as to the sale, transfer, and death of any stud animal registered in the herd book, it will be possible for Australian breeders to emulate the example set by Secretary Christen, and investigate the position to ascertain whether our Berkshire and other breeding sows are as productive and as profitable as they ought to be.

The Council of the Australian Stud Pig Breeders' Society have adopted the following:—

"STANDARD OF EXCELLENCE" FOR BERKSHIRE PIGS.

Colour—Black, with white on face, feet, and tip of tail.

Skin—Fine, and free from wrinkles.

Hair—Long, fine, and plentiful.

Head—Moderately short, face dished, snout broad, and wide between the eyes and ears.

Ears—Fairly large, carried erect or slightly inclined forward, and fringed with fine hair.

Neck—Medium length, evenly set on shoulders; jowl full and not heavy.

Shoulders—Fine and sloping well backwards, free from coarseness.

Back—Long and straight, ribs well sprung, sides deep.

Hams—Wide, and deep to hocks.

Tail—Set high, and fairly large.

Flank—Deep and well let down, making straight underline.

Legs and Feet—Short, straight, and strong, set wide apart, and hoofs nearly erect.

Objections.

A perfectly black face, foot, or tail. A rose back. White or sandy spots, or white skin on the body. A white ear. A very coarse mane, and inbent knees.

WILT-RESISTANT TOMATOES.

Mr. N. A. R. Pollock, Northern Instructor in Agriculture, writes:—

The attached copy of a letter from Mr. J. T. Moore provides convincing testimony of the value of this Department's work in overcoming the "wilt" trouble in the Queensland tomato crops, through the introduction of resistant tomatoes. It is specially pleasing to note that the two varieties most successful and in greatest demand are "Bowen Buckeye" and "Denisonia," both of which are departmental productions.

Subjoined is the text of the letter to which Mr. Pollock refers:—

The following information with regard to the production and distribution of pure and reliable wilt-resistant tomato seeds may be of interest to you.

Acting on your suggestion made early in 1923, and in accordance with your advice and instruction, I have been growing for seed the six most profitable varieties of these wilt-resistant tomatoes. During the first season (1923-1924) I received 54 orders; for the 1924-1925 season, 300 orders; and from 21st November, 1925, to 1st March, 1926, 305 orders.

Each of the first two periods covers a term of twelve months. You will thus see what a wonderful increase in the demand has taken place as a result of the value of the seed becoming known. Orders have been received from every State in the Commonwealth except Tasmania, and including the Northern Territory. Orders have also been received from Ceylon, New York, and Papua. The latest order from foreign sources came from the Director of Agriculture, Sarawak, Island of Borneo. He informs me that he has been following your reports published in "Queensland Agricultural Journal" with great interest. Practically all the leading seed merchants in Australia have been in communication with me on the subject of this seed. Mostly they desire quotations as well as information. My correspondence shows that these seeds are giving great satisfaction wherever the right variety has been planted. The splendid germination is constantly being commented on. The heavy cropping, fine flavour, and carrying capacity of the tomatoes themselves are giving growers great cause for satisfaction. The number of repeat orders being received, and the orders which are coming to hand on the recommendation of other growers, are very pleasing features.

The varieties most favoured are "Bowen Buckeye" and "Denisonia." Quite a considerable quantity of seed has been purchased this season by Bowen growers, which probably is the best recommendation of its excellence that could be obtained.

In conclusion, I have to congratulate you on an achievement which will have most lasting and beneficial results, which has added to my own personal prosperity and conferred incalculable benefit not only on Bowen tomato growers but on growers of this commodity wherever it is grown.

MEASURES AGAINST HAIL.

From a report on Agricultural Meteorology (Int. Agr. Inst. 1924)—Annexe I.

Different measures of defence have been employed in France to protect crops against hail, but only the "Fusees paragreles" have remained in favour, and it is estimated that 30,000 of these are manufactured annually in French factories. Agriculturists who use these fuses say that apart from their efficacy they are easily managed and that no costly installation is necessary. They say that they have observed that, following the penetration and detonation of these fuses in the heavy clouds, the latter seem to break and disperse. The adversaries of this process, however, say that hail is a phenomenon which is so irregular in time and space and its fall is often so local that it is difficult to pronounce on the action of the rockets. They specify that a district which is often subject for a long period of years to hail may receive none during a new period of practically the same length. These artifices show that the question of their efficacy is not yet cleared up and cannot be until methodical experiments have been undertaken. There are at the present time, on the French market, numerous models of rockets for use against hail. Certain of these are manufactured with first-class materials, and others, on the contrary, are of inferior quality with an efficacy which can be considered as nil, and their use has led to their abandonment in certain districts. Numerous agricultural syndicates for defence against hail are convinced that with apparatus well thought out, both from the point of view of the height of detonation and force of explosion, that they would have an efficacious defence against hail, and have asked for studies to be carried out to place at their disposal apparatus at a reasonable price. On the demand of the Agricultural Research Institute, the Ministry of War is now actually carrying out studies at the Pyrotechnical School. One can hope that they will not merely result in a type of rocket for use against hail fulfilling all the desiderata of agriculturists, but will also furnish the latter with information enabling them to control the quality of such artifices which are sold by private firms. At the present time firms make several types which seem to function satisfactorily, but of which conditions as regards safety, strength, and keeping quality could be improved. As soon as the new artifices have been elaborated and a sufficient stock obtained, methodical experiments will be organised by the Agricultural Research Institute in a district peculiarly liable to hail.

The foregoing extract was obtained from the Ministry of Agriculture and Fisheries (United Kingdom) in response to a request from this Department for recent information regarding the Stiger Vortex gun system for hail prevention. The Imperial Department also advises that a publication of the International Agricultural Institute "L'assurance grele dans quelques pays, et ses problemes," issued in 1911, contains particulars of experiments with the Stiger system conducted in France, Spain, Italy, and other European countries; while the Bulletins for November, 1910, and July, 1912, of the Bureau of Agricultural Intelligence and of Plant Diseases of the same Institute, contain short articles in English entitled "Protection against hail" and "The discharge of rockets to keep off hail" respectively.

MARKETING TABLE POULTRY.

In the true sense of the word, table poultry is not produced to any extent in this State, nor does the demand warrant its production.

The basis of the poultry industry is egg production, for which breeds such as Leghorns, utility Orpingtons, &c., are bred, the former variety predominating. Under these conditions the class of bird which forms the bulk of poultry sold for table purposes are young cockerels of both light and heavy breeds and hens culled on account of their age, or for other reasons which have rendered them unprofitable as egg producers.

In marketing there are two distinct conditions to be considered, namely:—1. Conditions which are entirely in the hands of the individual producer; and 2, conditions under which the birds are sold. The latter conditions, by reason of the fact that they apply to all producers selling poultry and to the fact that they do not come under the immediate control of the individual producer, are possibly the most important and therefore can take precedence.

Present System of Sale.

Although large numbers of birds are sold privately, the greater portion reach the consumer per medium of the auction markets. A conservative estimate of the value of poultry sold daily in the metropolitan area would be in the vicinity of £250. This, to some, may appear rather a high estimate, but an inspection of the markets will convince the observant person that the estimate errs on the low side.

These birds are received by the selling agents from the rail, or direct from the producer, in crates of all types, shapes, and sizes. They are then dumped on the saleroom floor, no effort being made by either the producer or agent in the direction of classification, and sold to the highest bidder.

Undoubtedly at times, even under these conditions, the birds tendered for sale realise very remunerative prices, but again at other periods they are sold considerably under their value. The low values are, no doubt, influenced by the supply and demand, but at the same time, if the birds were classified, displayed to advantage, and put up for auction in numbers which would permit of the general householder bidding, values would be materially increased.

The conditions under which table poultry are sold undoubtedly leaves room for improvement, both from a humane and a commercial point of view. From the humane point of view the crates used for forwarding birds to market should have sufficient head room and floor space for the number and variety consigned. They should be well ventilated and provided with water receptacles, the latter being firmly attached to each corner of the crate. The crates for fowls and ducks should be at least 18 in. high, and that for turkeys and geese 30 in. This permits of the birds crated being able to stand erect without injury. The actual dimensions or area required for an individual bird naturally varies according to the numbers and variety to be marketed at one time. Crates 4 ft. long by 2 ft. 6 in. wide, with a partition in the middle, will comfortably hold sixteen to twenty birds, according to their size and to the prevailing climatic conditions. The object of the partition is to prevent crowding to one end and consequent losses in the event of the crate becoming tilted in transit. The application of a little thought on the part of the producer as to the birds' comfort in transit should prevent overcrowding of crates.

Now, if the crates are well constructed, they will last for some time, as well as insuring the comfort of the birds both in transit and while awaiting sale. Good crates are worth being returned from markets, which obviates the necessity of constantly making makeshift crates. There is a correct time for marketing stock, whether they are young or old. Every day they are kept on the farm after reaching the period is adding to the farm costs. If crates are not available at the time the birds are invariably retained, possibly a week or so longer. The crates can, with a little care, be so constructed as to permit of the birds being seen to advantage by the buyers. Under the present conditions of selling, it is a few minutes' work for the assistant to burst open a crate and pass a bird or two around for inspection. Doors placed on the top of the crate would facilitate the work, allowing buyers greater time for examination.

At present practically the only type of buyer operating at poultry sales are poulterers and buyers for hotels and restaurants. Small buyers—that is, the household consumers—are unable to buy, for the sufficient reason that the birds are sold per crate at so much per pair. This may be necessary for the purpose of expediting sales, but it undoubtedly restricts the consumption of poultry meat, and producers would find it to their advantage to market choice stock in small lots.

To what extent the trade of selling dressed poultry is carried on is hard to estimate. The price charged by the majority of poulterers appears excessive, and frequently one notices very inferior stock exposed in windows for sale. There should be plenty of scope for the sale of dressed poultry at reasonable prices, providing it was as easily available to the consumer as butchers' meat and as reliable as regards quality.

Just how a dressed poultry trade is to be worked to the best advantage is difficult of solution, but the first essential is a live organisation, with loyal supporters, with the assistance of cold storage for holding reserves, regular supplies would always be available which would permit of contracts being made with clubs, leading hotels, &c., as well as supplying regularly, per delivery service, to private homes. Failing a delivery system being put into operation for the latter purpose, the selling of dressed poultry could be made a feature in many butchers' shops, but before this can be done an organised effort would be essential.

The individual producer has to give consideration to such questions as the time of marketing, condition of stock, grading, and crating.

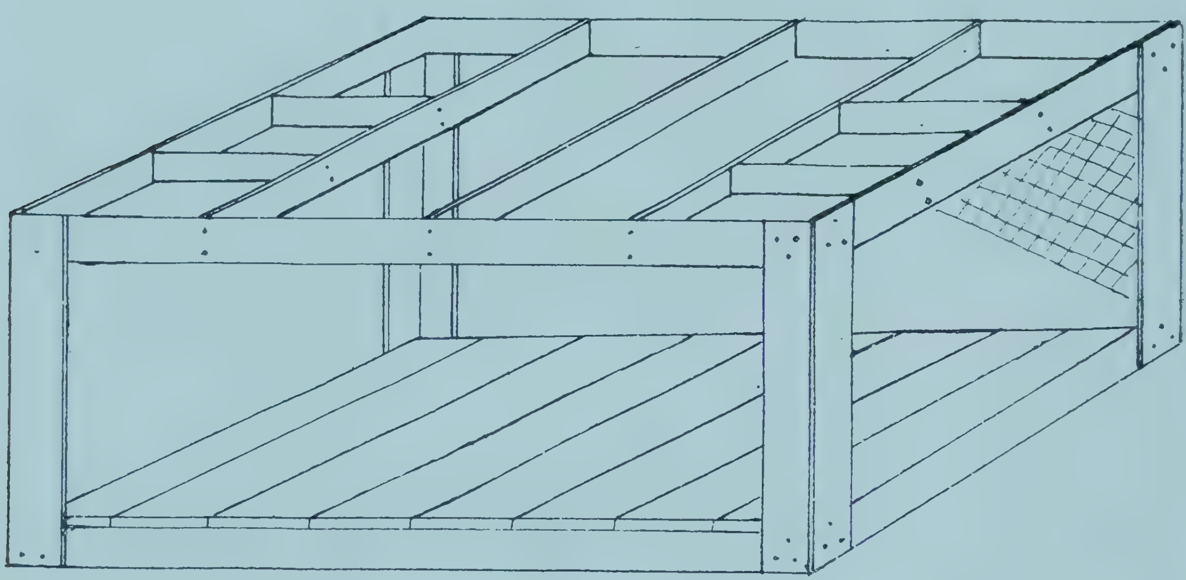
Cockerels constitute possibly the majority of the birds that a producer has yearly for sale, and present greater difficulties by reason of the fact that they have to be disposed of during a relatively short period. They may be sold at various ages, each age having its special advantage. Although the majority of the buyers prefer young stock for table purposes, they will not pay high prices for small half-grown birds when larger hens are available, which would proportionately be much cheaper. Having this in view, it is not a desirable practice for the producer to send half-grown cockerels to the market and expect to receive good prices for them during the period when the great majority of our old hens are being disposed of on account of age.

This period varies, but usually extends from some time in January until April. Young half-grown birds will find a ready sale from August until the Christmas season. After that period young stock should be well grown to command good prices, but not kept until they become staggy, which is indicated by spur growth.

It is necessary to give some attention to the general condition of the birds to be marketed. No good is done by sending on stock to saleroom low in condition, especially when it is considered that, in old hens particularly, there are only a few in such a state. It is not suggested that any attempt be made to fatten this class of bird, as they generally are constitutionally unfit, and the producer's ends would be better served if they were destroyed, as it may happen that these particular birds will be those examined by prospective buyers.

Cockerels, however, should receive some consideration and not treated, as they too frequently are, as an incumbrance and not worth feeding. If they are to be kept for any time at all they should be well treated and receive the same attention as the pullets; they have got to be grown, and the cheapest and quickest way of doing this is to feed them well. Rubbish in the way of food is no good. They require, for economical growth, the same ration as the pullets. Keep them free from intestinal worms and dispose of them as early as possible.

Crating should receive the attention previously suggested, and a good layer of straw or grass placed on the floor to ensure the stock being in a clean condition on reaching the market. The birds crated together should be alike as possible as regards age, size, and condition, and of the one variety.



Rough Sketch of Crate Suggested.

The sketch illustrates a crate of simple design, the measurements being 4 ft. long, 2 ft. 6 in. wide, and 18 in. high. It is made entirely of pine, the frame being 3 in. by $\frac{3}{4}$ in., and the bottom 6 in. by $\frac{5}{8}$ in. Doors are provided in the top, and the whole structure covered with $1\frac{1}{4}$-in. mesh netting. If larger netting is used, it is desirable to place a piece of timber around the frame at least 2 in. higher than the floor to prevent the birds' legs protruding and becoming injured.

TWO INTERESTING PLANTS FROM NORTH QUEENSLAND.

In a recent paper read before the Royal Society of Queensland, Messrs. C. T. White and W. D. Francis described several new plants, among them the two trees here depicted. *Xanthostemon Youngii* was found at Temple Bay, Cape York Peninsula, by Mr. J. E. Young in July, 1923, when he accompanied Captain Wilkins in his visit to that territory. The species is peculiar among Australian species in its bright-red (not yellow or white) flowers, in which respect it approaches some species of the genus found in New Caledonia.

Cryptocarys corrugata was found on the Eungella Range by Mr. W. D. Francis, and was so named from the surface of the sapwood being longitudinally furrowed or corrugated. The genus is a large one widely distributed through the tropics and subtropics. The species attains a height of nearly 100 feet and stem diameter of 2 feet, and may later prove a useful timber.

Plate 135.—Cryptocarya corrugata—A New Tree from the Eungella Ranges.

(1) A Fruiting Shoot about half natural size; (2) Underside of Leaf, natural size; (3) Traverse section of a Fruit; (4) A Cotyledon.

PLATE 136.—XANTHOSTEMON YOUNGII—AN INTERESTING TREE FROM THE CAPE YORK PENINSULA.

(1) A shoot about half natural size; (2) Anther; (3) Underside of calyx (3a) Calyx and ovary from above; (3b) Calyx and ovary from the side; (4) Fruit, side view; (4a) Fruit from above; (4b) Fruit in cross-section; (5) Seed.

INFECTIOUS CONJUNCTIVITIS (BLIGHT) IN CATTLE, SHEEP, GOATS, AND HORSES.

Cause.

This affection is by many held to be infectious, while others attribute it to irritant pollen or soil emanation.

Owing to the greater number of cases occurring during the summer months the pollen theory is supported, but it is also recognised that organised germs are preserved, multiplied, and diffused to a greater extent in the hot season, so that the origin of the disease from a purely microbian source is equally suspected. It is well known that in many outbreaks the affection spreads rapidly from animal to animal.

Symptoms.

Eyes become closed and swollen. Profuse secretion of tears, sometimes mixed with blood, changing in a few days to a thick purlulent white or yellow secretion. In many cases the cornea becomes opaque, and in some instances erosions occur which cause perforations or loss of the eye.

Treatment.

Where practicable animals should be kept in cool, darkened stalls, although with large mobs of cattle or sheep this is impossible. The animals should be given an active purgative—Cattle, 1 lb. to 1½ lb. Epsom salts in three or four quarts of water; Sheep and goats, 4 oz. to 6 oz. Epsom salts in half a pint of water; horses, 4 to 5 drachms of Barbadoes aloes dissolved in one to one and a-half pints of water.

A few drops of the following solution should be applied to the affected eyes two or three times daily by means of a small glass syringe:—

Sulphate of zinc	10 grains.
Boracic acid	20 grains.
Water	8 ounces.

—Major A. H. CORY, M.R.C.V.S.

QUEENSLAND SHOW DATES, 1926.

The following is the official list of Queensland Show Dates for 1926, as issued by the Queensland Chamber of Agricultural Societies:—

Taroom: 3rd to 5th May.
Longreach: 5th and 6th May.
Oakey: 6th May.
Toogoolawah: 6th and 7th May.
Charleville: 5th and 6th May.
Wondai: 11th and 12th May.
Murgon: 13th and 14th May.
Blackall: 11th to 13th May.
Goombungee: 13th May.
Boonah: 12th and 13th May.
Roma: 18th and 19th May.
Kilkivan: 19th and 20th May.
Ipswich: 19th to 21st May.
Springsure: 19th and 20th May.
Wallumbilla: 25th and 26th May.
Esk: 26th and 27th May.
Maryborough: 25th to 27th May.
Childers: 29th to 31st May, and 1st June.
Marburg: 2nd and 3rd June.
Bundaberg: 3rd to 5th June.
Hughenden: 8th and 9th June.
Beaudesert: 8th and 9th June.
Gin Gin: 8th to 10th June.
Mundubbera: 9th and 10th June.
Woombye: 16th and 17th June.
Gayndah: 15th and 16th June.
Gladstone: 15th and 16th June.
Lowood: 18th and 19th June.
Mount Larcom: 18th and 19th June.
Rockhampton: 23rd to 26th June.
Gatton: 30th and 1st July.
Kilcoy: 1st and 2nd July.
Mackay: 1st to 3rd July.
Townsville: 6th to 8th July.
Laidley: 7th and 8th July.
Biggenden: 1st and 2nd July.
Woodford: 8th and 9th July.
Wellington Point: 10th July.
Charters Towers: 14th and 15th July.
Caboolture: 15th and 16th July.
Mount Gravatt: 17th July.
Maleny: 21st and 22nd July.
Rosewood: 23rd and 24th July.
Ayr: 23rd and 24th July.
Barcaldine: 27th and 28th July.
Nambour: 28th and 29th July.
Pine Rivers: 30th and 31st July.
Redcliffe: 4th and 5th August.
Sunnybank: 7th August.
Royal National: 9th to 14th August.
Crow's Nest: 25th and 26th August.
Coorparoo: 28th August.
Wynnum: 3rd and 4th September.
Enoggera: 9th September.
Zillmere: 11th September.
Gympie: 15th and 16th September.
Beenleigh: 16th and 17th September.
Pomona: 22nd and 23rd September.
Esk (Camp Drafting): 24th and 25th September.
Rocklea: 25th September.
Toombul: 1st and 2nd October.
Kenilworth: 7th October.

Answers to Correspondents.

Physical Defect in Boar.

H.B. (Milbong)—

Mr. Shelton, Instructor in Pig Raising, advises that, without inspection of the boar, it is not possible to express a definite opinion as to the effect on the animal or on his value for show purposes of the weakness noticeable in the front legs.

Unfortunately, many of our Berkshires, and some of other breeds also, show a tendency to weakness in the front legs. Some animals have had to be discarded altogether for this fault. There is always the possibility that the weakness may be hereditary, though perhaps to a large extent this could be overcome by mating the boar with sows strong in the legs. Mr. Shelton has often rejected weak-legged pigs when judging stock at shows, and, of course, when competition is keen these faults count for a great deal. It would pay to allow the boar the run of a good grassy paddock and to keep him off hard floors, for this sometimes exaggerate leg trouble. The feeding of lime water, sterilised bone meal, and charcoal is advised in order to strengthen the bony structure.

Meat Products for Pigs.

C.H. (Proston)—The Instructor in Pig Raising (Mr. Shelton) advises:—

Dried blood and blood meal are in reality the same product, the latter possibly carrying some bone content. The best product for feeding pigs is the meat meal, details of which are given in the pamphlets forwarded, for blood meal is an expensive line for general feeding purposes. Meat meal can be used to considerable advantage in combination with maize, pollard, &c., but where maize and pollard are being fed with milk and with green foods such as lucerne, rape, and barley, saccaline, &c., there should not be the same need for meat meal as in cases where both milk and green foods are in short supply. As a pig reaches maturity it requires less concentrated food, but in comparison more bulky food.

It is good to note that your experiments in pig-feeding have been so successful. The secret of success in feeding pigs lies largely in the judicious utilisation on the farm of food supplies produced thereon, and in feeding these to healthy, well-developed stock suited to the class of production required.

Thriftless Pigs.

P.C. (Mundubbera)—

You have got hold of what would, in the stockyard, be called a "crook" line of pigs, a line which has evidently been weaned very early, probably at five or six weeks old and before they had learned to feed from their own feeding trough. Pigs in such a condition fret considerably for their mother and what with this restlessness day and night, and a class of food probably in their case difficult of digestion, they get a very bad set back. They are thus susceptible to any disease which may happen along—such, for instance, as an epidemic of influenza—for there are epidemic diseases among stock just as there are outbreaks of disease among human beings.

The dry cough possibly also indicates irritation of the throat, perhaps through dusty yards or coarse fibrous feeding stuffs. Young pigs, such as those to which you refer, sometimes get into the habit at night time of all sleeping together packed up, as it were, in one corner of the sty. They will even crawl over one another in an endeavour to secure a better "possie." The result is that those for the time being underneath become overheated and sweated until finally they are forced to wriggle out. This upsets the others, perhaps a sort of fight results, and very often the overheated animals finish up on the outside of the pack altogether; then they will chill down very rapidly, and finish up with cold in the head, cough, &c.

Tuberculosis is all too common in many of our piggeries, particularly on dairy farms where the cows have not undergone the tuberculin test. Mr. Shelton advises getting rid of the bad doers.

Constipation, indigestion, and parasitic infestation are both indicated in the symptoms your describe. Why not ask the District Stock Inspector to call in and advise you?

Plant Identified—"Portuguese Elm."

W.P. (Imbil)—

The Government Botanist, Mr. C. T. White, F.L.S., advises that the specimen No. 181A, forwarded with your letter of the 13th instant, is *Celtis sinensis*, a native of China. It is commonly called in Queensland "Portuguese Elm," a name more rightly belonging to another species, *Celtis australis*, a native of Southern Europe. *C. sinensis* has attracted some attention lately as a fodder.

Soudan Grass Seed not Favoured as Pig Food.

C.H. (Yangan)—

Re feeding Soudan grass seed to pigs, this seed being adulterated with castor-oil plant seed, and probably other seeds, the Instructor in Pig Raising (Mr. Shelton) cannot advise the use of this as pig food, for it is certainly quite possible to poison pigs by feeding castor-oil beans or other seed containing toxic properties, particularly where these seeds are ground up and the resultant meal used as a mash with pollard, &c. In fact, there are many other foods of a poisonous or at least an injurious nature, such for instance as musty or mouldy grain, decaying curd, and other milk products which have become decomposed. Then, of course, brine, the water in which salt meat has been cooked, hot cabbage water, and decomposing soup and meat products must not be given to pigs. It does not pay to give any food to pigs about which there is the slightest doubt, and it is certainly an erroneous idea to think that it is not possible to poison pigs.

The Care and Feeding of Pigs.

J.C. (Bemerside)—

Pigs must have a certain proportion of grain food and some mineral matters in addition to a liberal supply of green food and drinking water. Cassava, boiled, is not altogether a suitable food for pigs except as part of a well-balanced ration. It is very fibrous, and is liable to cause digestive disorders if fed too liberally, though we are well aware that it is spoken of very frequently as a very suitable pig food.

Mr. Shelton advises that experiments are planned to test cassava as a pig food in comparison with other crops and as part of a ration, and the result will be given due publicity. Molasses mixed in water is an unsuitable food, though molasses can be and is being used to advantage, but only when its use takes the form of a condiment (like sugar sprinkled over the morning plate of porridge) or when it is worked in a ration balanced up with protein foods, for molasses is a heat and energy producer and not a flesh former.

Re the use of green panicum grass cut fine with the chaff cutter—here again you are using a fibrous and apparently coarse feeding stuff, for it should not be necessary to chaff any green food for pigs; they much prefer succulent green stuff before it reaches the coarse fibrous seeding stage. Even sorghums, which should not be fed before they flower, are of greater food value in the succulent juicy stage. They are reduced in food value, though to an extent still useful, when the leaves turn yellow and the plant dries or is frosted off. The addition of pollard to a coarse fibrous ration is not advised; it would be preferable to mix the pollard with water, adding from one-half to, say, two pounds of molasses to the ordinary daily ration of the pigs, the larger quantity for full-grown animals. Some breeders add from one tablespoonful (about half fluid ounce) to half a pint (40 fluid ounces); this could be added to each gallon of milk where the latter is being fed, and the same quantities, or slightly more, could be used where water takes the place of milk, but it is preferable to feed a very small quantity at first, increasing the amount as the animals become accustomed to it. It must always be remembered that the laxative effect of molasses may lead to digestive disorders and cause severe scouring, particularly in very young pigs if given in excess, hence great care is necessary in the early stages of its use.

As to whether you could grow pigs profitably on a diet of cassava (boiled), molasses, and chaffed panicum, our advice is not to attempt it, for the diet is quite unsuitable, and the stock will not develop satisfactorily. You will need to read up this subject carefully; remember also that while cowpeas in the form of grain can be utilised as a satisfactory green food, the cowpea vine is also too fibrous, and few pigs will attempt to eat it if there is any other more succulent green stuff available. Pamphlets forwarded.

Tuberculosis in Pigs.

G.N. (Toogoolawah)—

The Instructor in Pig Raising (Mr. Shelton) advises that it is apparent that some of your pigs are suffering from tuberculosis. This disease invariably finds its way to the pig by milk from diseased cows or flesh of carcasses suffering from the disease. We recommend your having the District Stock Inspector inspect your cows with a view to advising you as to their health; he may even recommend the Tuberculin test, for this is recognised as the surest test for ascertaining whether animals are diseased or not. We note that you keep your pigs in a shed with a cement floor. The pigs would be far healthier if they were kept out in a good pig-run, where they would have the benefit not only of the sunshine, but of good succulent grass and green stuff. It is not absolutely essential that pigs should be shut up in small sties for fattening purposes; they mature to more advantage when given reasonable exercise and liberal supplies of green food with their grain and milk. See Pamphlet re Construction of Sties, &c.

"Wild Lucerne" *(Stylosanthes mucronata)*.

L.H. (Brandon)—

The Government Botanist, Mr. C. T. White, F.L.S., advises:—

The plant forwarded for identification is *Stylosanthes mucronata*, commonly known in North Queensland as "Wild Lucerne." It is a native of the West Indies and tropical America, but has now a wide distribution over the tropics generally. It was first noticed about Townsville in 1913, and was then simply regarded as a pest on town lawns, but as soon as it spread it was recognised as a valuable fodder, both palatable and nutritious. An analysis made by the Agricultural Chemist (Mr. J. C. Brünnich, F.I.C.) showed it to compare favourably with lucerne in nutritive value. The only drawback to the plant is its annual character.

"Roley Poley"—Noxious Weeds.

J.G. (Bowenville)—

The Government Botanist, Mr. C. T. White, F.L.S., advises that the specimens of "Roley Poley" forwarded with your letter of the 7th instant are—

No. 1.—*Bassia Birchii* (see leaflet posted). This plant is also commonly known as Galvanised Burr. This species is spread throughout the whole of the Central West and South-West, Western Darling Downs, and similar country. It is, Mr. White thinks, most abundant in the Darling Downs, Maranoa, and Warrego districts.

No. 3.—*Bassia quinquecuspis*. This species has much the same distribution as *Bassia Birchii*. It is believed to be most abundant in the Central West (Mitchell district), where it is commonly known as "Bindii" or "Bindy-eye," a name now applied to a number of burr plants in Western Queensland.

Nos. 2 and 4.—Mr. White would refer both to *Bassia graciiicuspis*. Most botanists refer this to a variety of No. 3 under the name of *Bassia quinquecuspis* var. *villosa*. He prefers, however, to keep it as a species intermediate between the other two. It has much the same range as Nos. 1 and 2, but is most abundant in the Darling Downs and Maranoa districts.

With reference to your other query, the following appeared in the last annual report of the Prickly-pear Land Commission, pp. 48-49:—

"There are other serious noxious weeds in the State besides prickly-pear, but the all important difference is that the pear is an air plant while the others are not. If pear is cut down the plant still lives. The butt grows again while the fallen leaves strike fresh root. Owing to this quality the pest can never be said to have been destroyed until by the application of poison of fire it has become lifeless to the extremities of the roots. Although this characteristic is confined to the pear other noxious weeds are sufficiently serious to engage close attention.

"Some ten years ago 'galvanised burr' was not widely known. One can remember that in the St. George district, only seven years ago, its mention called forth the smiles of the unknowing. Now, unfortunately, it is known all too well. Originally confined to the stock routes, its spread during the last few years has been amazing. Whole paddocks have been ruined by it. What might have been eradicated for a few pounds ten years ago would now cost many thousands. Well might local authorities and others take heed of the teachings of the past. Other districts yet have time to protect themselves. There is still truth in the old adage, 'A stitch in time saves nine.'"

"Wild Cotton" or "Balloon Cotton."

F.R. (Tumoulin)—

The Government Botanist (Mr. C. T. White, F.L.S.) advises that the specimen sent is *Gomphocarpus physocarpus*, known in Queensland variously as "Wild Cotton" and "Balloon Cotton." It is a native of South Africa and along with a closely allied species (*G. fruticosus*) is a common weed on Queensland farms, often over-running them and proving a great pest, particularly on rich scrub country. It has been thought that the cotton contained in the pods and attached to the seeds might be of commercial value, but any value it possesses is only that of a kapok; it is of no use for spinning. The bark is fibrous and, no doubt, with a cheap system of collection and treatment would be of commercial value. The plant has been accused of poisoning stock, but nothing very definite is known under this head; it belongs, however, to a poisonous family, the Asclepiadeæ, and therefore the reports may have some foundation in fact. Fortunately it is very rarely troubled by stock. Though a weed the plant is often grown in gardens, on account of its rather quaint characters. I will be pleased to report on plants you send at any time and on which you require some information for your nature study work.

Impaction in Sheep.

V.E.W. (Surat)—Mr. W. G. Brown, Instructor in Sheep and Wool, advises:—

I note that your correspondent fears impaction through having only dry feed for his ewes. He is right. This can be avoided by the use of Epsom salts, especially as his sheep drink at troughs. This can be administered by keeping up a supply of Epsom salts to the water they drink. I must state that purgatives are generally dangerous to give to pregnant sheep, but it can be arranged that they do not get anything violent in that way. Sheep on dry feed and in warm or hot weather require about one gallon of water per day. If 5 per cent. of Epsom salts be added to the water in the troughs, it will help the sheep over the troubled time of lambing as far as impaction is concerned. The method I advocate is to place a cask, say of 30 gallons, on the end of the trough and nearly fill it with water, adding Epsom salts in the proportion of about one and one-half ounces of Epsom salts per gallon. This should be dribbled into the troughs through a small hole in the cask. If there is a big drain on the troughs through the hours when sheep drink, care should be taken that more salts be used. Epsom salts may be purchased in bulk from Messrs. Taylor and Elliott, manufacturing chemists, Brisbane, at about 3d. per lb. Epsom salts is much cheaper and more effective than molasses.

Suggestions for Show Schedule.

P.C. (Mundubbera)—The Instructor in Pig Raising (Mr. Shelton) suggests the following as a suitable show schedule:—

Berkshires.—Berkshire boar, 12 months old or over; Berkshire boar under 12 months; pen of three Berkshire boars or sows or mixed sexes under 4 months; ditto for sows, except pen of three. Ditto for Tamworths.

In Poland-Chinas provide classes for boar and sow any age, ditto for Middle Yorkshires, Duroc-Jerseys, and any other pure breed.

Champion Badge for best boar and sow of the Show and for best pen of three purebred pigs.

In baconers and porkers the following classes might be provided:—

Three Bacon Pigs, any breed or cross, 90 to 120 lb. estimated dressed weight: none but prime-quality baconers and porkers will be eligible to win in these classes.

Three Porker Pigs, any breed or cross, 60 to 80 lb. estimated dressed weight.

Champion pen of Bacon Pigs.

Re Sow and litter, this is not a very satisfactory class and had better be deleted unless you have had good entries in the past.

Re prize money. It is suggested that £2 2s. as first prizes, and £1 1s. as second, with prize card for third and other awards throughout this section, be offered, as it is useless providing the classes unless the prize money is sufficient to warrant the expense.

A special prize for the best pig shown by a boy or girl attending any of the State or Rural Schools is also suggested. In this case some declaration would be necessary in order to ensure genuine competition from junior farmers.

General Notes.

Dairy Produce Act.

An additional regulation has been made under the Dairy Produce Act, providing that all cheese shall be aerated by the manufacturer at the factory before being despatched to oversea and interstate markets.

The Imperial College of Tropical Agriculture.

We have received a copy of the prospectus of the Imperial College of Tropical Agriculture, England, for the year 1926-27, including the Principal's report for the year 1924-25 and register. Former students of the College are now holding important agricultural positions in Uganda, the Gold Coast, the Sudan, Southern Rhodesia, Nyasaland, Ceylon, Natal, British Guinea, and the West Indies. The governing body of the College is making an appeal for £45,000 for the provision of a hostel for the students, and an estate on which the business side of farming can be taught.

An East Brisbane Sanctuary.

The grounds of the Church of England Grammar School and Heath Park, East Brisbane, have been declared a sanctuary for animals and birds, and Mr. R. G. Lanskey, M.Sc., Rev. E. A. Hunt, and Aldermen A. Elliott and R. W. H. Long have been made officers under the Animals and Birds Acts, and will act as honorary rangers for the sanctuary in question.

Atherton Tableland Maize Board.

In connection with the Atherton Tableland Maize Board, provision has been made that the onus of proof that any maize sold or delivered to or bought or received from any person other than the Board is or was not maize declared by the Order in Council constituting the Board, and declaring maize to be a commodity under the Primary Products Pools Acts, shall be on the person who sold or delivered or bought or received such maize.

City Milk Supply.

The Minister for Agriculture (Hon. W. Forgan Smith) made reference recently to the matter of a city milk supply. The Minister stated that two deputations from the Greater Brisbane Council had waited upon him in connection with this matter, He said that he recognised that the matter of providing the citizens with a supply of pure milk raised under highly hygenic conditions and delivered to the consumers in a pure and wholesome condition was to be regarded as a function of the Council.

The members of the Council specifically desired that the supervision of the dairies within the Greater Brisbane area should be brought under their direct purview. Mr. Smith informed the deputation that he was prepared to accede to their request in this matter. Additionally, the Council submitted a scheme under which it was proposed to deal with the treatment and delivery of milk within the Council area.

The principal features of the scheme included the establishment of a depôt to which there would be attached an inspectional staff, who would examine and pass the milk conforming to the required standards, and, further, the Council would enforce the block system for milk delivery.

''Since the proposed scheme for the control of the milk supply has been in my possession,'' stated Mr. Smith, ''I have had opportunity to peruse and consider same. It is obvious that the scheme in its existing form fails to meet the case. The provision that warm milk should pass through a single depôt would in practise mean that milk would be drawn over long distances to the depôt for treatment, and subsequently the milk would be carried over the same stages to the consumer.

''Say, for example, that it was decided to erect a depôt in the vicinity of the Roma Street Railway Station, it would then follow that the milk raised at Caboolture or Bowen Hills would be brought into the depôt through Eagle Junction, and after treatment it would be conveyed back to Eagle Junction for distribution amongst the consumers there.

''A provision is also made to impose a rental of £75 per week upon the depôt, and lease it to a company, which will be formed for the purpose of engaging in the milk trade, thereby practically ensuring a monopoly of the milk trade to whatever company may decide to lease the depôt from the Council. This I consider is wrong in principle, and I much doubt the authority of the Council to give a monopoly of the milk trade to any company.''

"Bunchy Top" a Notifiable Disease.

All proclamations and regulations under the Diseases in Plants Acts have been revised, and a consolidation of same has now been made. Included in the proclamations is one making Bunchy Top a notifiable disease.

Sugar Assessments.

The Minister for Agriculture (Hon. W. Forgan Smith) announced recently that consideration had been given to the question of payment of assessments by millowners and owners of sugar works under *"The Regulation of Sugar Cane Prices Acts,* 1915 *to* 1922," *and "The Sugar Experiment Stations Acts,* 1900 *to* 1923," respectively.

It has been decided that the levy on every ton of sugar received at a mill during the season 1926-27 under the former Act shall be 1d., and under the latter Act ¼d. This represents a reduction in each case to half the rate of assessment which was hitherto collected, and if applied to a crop of equal tonnage to that of last season would represent a saving to the sugar industry of approximately £19,800.

Predaceous Enemy of Banana Weevil Borer—Further Importations to Queensland.

The Chief Entomologist (Mr. Veitch) has received from Java a further colony of a predaceous beetle, the establishment of which may materially assist in the control of the banana weevil borer in Queensland. The colony just to hand has been liberated in the Yandina district by Mr. Froggatt, the Entomologist in charge of banana insect pest investigations. Another colony is expected in the immediate future, and arrangements will be made by the Department of Agriculture and Stock for its liberation on a suitable plantation. These importations are wholly experimental, and the efficiency of this predaceous beetle under Queensland conditions still remains to be demonstrated if and when it becomes permanently established in this State. The information available regarding its voracious feeding habits is, however, sufficiently impressive to warrant the importations now being made.

Staff Changes and Appointments.

The appointment of Mr. J. P. H. Clark as Inspector of Stock, Blackduck Creek, Helidon, has been confirmed.

Mr. L. L. Manchester, Part-time Veterinary Officer, Rockhampton, will be transferred to Atherton as from the 1st June, 1926.

Mr. C. A. Morrison will act as Chairman of the Proserpine Local Sugar Cane Prices Board during the absence on leave of Mr. G. A. Cameron.

The Hon. A. M. Campbell, I.S.O., of Caloundra, has tendered his resignation as Officer under the Animals and Birds Acts, and same has been accepted.

Mr. T. R. E. Mitchell, Manager of the State Nursery, Bribie Island, has been appointed Officer under the Animals and Birds Acts.

The term of office of the present Members of the Butter Board, viz., Messrs. J. L. Wilson, J. T. Mulcahy, J. Purcell, C. H. Jamieson, T. F. Plunkett, and L. R. Macgregor, has been extended from the 28th April, 1926, to the 31st July, 1926.

Mr. C. F. McGrath has been appointed Supervisor of Dairying, Department of Agriculture and Stock, as from the 1st April, 1926.

Mr. H. Barnes has been appointed Temporary Inspector under the Diseases in Plants Acts.

The resignation of Mr. H. Hallam, Inspector of Slaughterhouses and Inspector Live Stock and Meat Export, has been accepted as from the 26th March, 1926.

Mr. L. A. Mackenzie has been appointed Government Representative on the Leichhardt East Dingo Board, *vice* Mr. F. P. Green, resigned.

Mr. H. C. Pegler has been appointed Government Representative on the Adavale Dingo Board; and the Clerk of Petty Sessions, Blackall, has been appointed Government Representative on the Barcoo Dingo Board during the absence of the Police Magistrate, Blackall.

The resignation of Mr. T. Flood Plunkett as Government Representative on the East Moreton Dingo Board has been accepted.

The resignation of Mr. H. N. C. Cannon, of Woodbury, as Honorary Inspector, Diseases in Plants Acts, has been accepted.

Mr. S. F. Russ and Mr. F. G. Harris have been appointed millowners' representatives on the Cattle Creek Local Sugar Cane Prices Board, *vice* Messrs. P. H. McLean and D. D. Lehane.

Appreciation.

A Southern correspondent writes: "I am unable to remember having acknowledged receipt of the booklets requested in mine of the 20th February last, but as one of them proved of great service to me to-day, I take this opportunity of asking you to accept my thanks for same. They are a most useful budget of information, written in language that is comprehensible by the most illiterate, and frequent recourse to the information contained therein should make farming a much safer proposition."

Portland Cement—Australian Standard Specification.

The Australian Commonwealth Engineering Standards Association announces that the tentative Australian standard specification and tests for Portland cement, which was published in May, 1925, will be reviewed for issue as an Australian standard specification in May next. The policy of the association is to issue each of its specifications in tentative form for a period of twelve months, during which time constructive criticism is invited. All criticism submitted to the association is referred to the sectional committee concerned for consideration when the specification comes under review.

Manufacturers and users of cement and others interested in the specification in question are invited to submit suggestions for the revision of the tentative specification, to be forwarded to the headquarters of the association, Macleay House, 16 College street, Sydney, not later than Saturday, the 15th May, 1926.

Opossum Boards.

The Department of Agriculture and Stock has announced the following appointments of trappers' representatives on Opossum Boards. These appointments were necessary, as no nominations were received for the position on the boards indicated:—

Moreton Opossum Board, G. W. Martens.
South-Western Opossum Board, W. J. Shanahan.
Northern Coast Opossum Board, C. G. Fallon.

The personnel of the eight Opossum Boards is as follows:—

Moreton Opossum Board (headquarters Brisbane)—
R. P. M. Short (chairman and Government representative).
C. S. Delpratt (owners' representative).
G. W. Martens (trappers' representative).

Darling Downs (headquarters Toowoomba)—
R. J. F. O'Bryen (chairman and Government representative).
Donald Gunn (owners' representative)
H. Slack (trappers' representative).

South-Western (headquarters Roma)—
J. L. Bowman (chairman and Government representative).
S. R. C. Harding (owners' representative).
W. J. Shanahon (trappers' representative).

Wide Bay and Burnett (headquarters Maryborough)—
J. Taylor (chairman and Government representative).
F. R. Briggs (owners' representative).
R. W. Macey (trappers' representative).

Central Coast (headquarters Rockhampton)—
W. H. Crank (chairman and Government representative).
T. Smith (owners' representative).
J. F. Lindley (trappers' representative).

Central-Western (headquarters Emerald)—
E. J. Tannock (chairman and Government representative).
C. P. Copland (owners' representative).
J. P. Ryan (trappers' representative).

Northern Coast (headquarters Mackay)—
S. J. Monaghan (chairman and Government representative).
—— (owners' representative not yet decided).
C. G. Fallon (trappers' representative).

Northern (headquarters Townsville)—
W. R. Holmes (chairman and Government representative).
A. Shepherd (owners' representative).
A. H. Bauman (trappers' representative).

Peanut Board.

An additional clause has been added to the Order in Council constituting the present Peanut Board, providing that all peanuts shall be delivered to the Board in an unshelled condition.

A notice has been approved with regard to the further extension of the Peanut Board for a period of either three or five years as from the 1st July, 1927, the period to be decided by ballot which will be held in June, 1926. The Board will operate on the same conditions as the present Peanut Board, and growers who have harvested not less than one half-acre of peanuts during the preceding twelve months are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane, so that their names may be placed on the roll of persons eligible to vote on the ballot when held.

State Insurance—Eight Years of Progress.

The Auditor-General has just completed an audit of the revenue account of the life department of the State Government Insurance Office up to 1st December, 1925. The Auditor's statement reveals the fact that the eight years' progressive march of the office is an indication that it has established itself in popular favour. The slogan of "Service Guaranteed and Satisfaction Assured" has caught on, and the under-mentioned figures are the result.

Altogether 4,770 new policies were issued by the office for sums insured amounting to nearly one and a third million pounds. The receipts were a shade under a third of a million, exceeding 1924 figures by £40,000. The life assurance fund, which by this time is not far short of a million pounds, stands at £858,385, which is nearly £220,000 ahead of that of 31st December, 1924.

It is of interest that 84·9 per cent. of the premium income was added to the funds, and that the average rate of income from invested funds at the above date was £5 12s. 11d. per cent. The invested funds amount to £833,683 18s. 5d., leaving uninvested only £24,701 9s. 11d. or 2·87 per cent. of total life funds.

Details are as follows:—Funds at 31st December, £641,620 0s. 7d.; first year's premiums, £39,766 10s. 7d.; renewal premiums, £215,392 11s. 8d.; consideration of annuities, £24,161 5s.; interest, £38,160 0s. 2d.; miscellaneous, £2,468 10s. 7d.; total, £961,568 18s. 7d. Claims and bonuses, £17,075 10s. 10d.; surrenders and bonuses, £14,729 18s.; annuities, £19,911 17s. 3d.; commission and expenses, £50,244 7s.; duty and taxes, £1,221 17s. 2d.; assurance fund, 31st December, 1925, £858,385 8s. 4d.; total, £961,568 18s. 7d.

Italy's Growing Business with Australia.

According to the correspondent of the "Times Trade Supplement," at Milan, commercial relations between Italy and Australia are expanding. Figures published, covering the first eight months of 1925, indicate an increase of Italian purchases from Australia. For example, Italian fresh and frozen meat imports rose from 595 tons in the corresponding period of 1924 to 12,400 tons; wheat, from 11,740 tons to 40,645 tons; animal fats, from 1,110 tons to 4,893 tons; rough hides, from 1,739 tons to 2,698 tons.

In Italian exports to Australia during the same period of 1925 a similar growth is noticeable. Almond exports amounted to 519 tons, compared with 321 tons in 1924; automobiles, to 125 tons (this figure being slightly under that of 1924, but comparing favourably with 77 tons in 1923); liquorice root made a big leap, with 595 tons, compared with only $6\frac{1}{3}$ tons in 1924, Australia, in fact, absorbing almost the whole of Italian exports of this article. The men's felt hat industry is also making great strides in its exports to the Commonwealth, the figures for the period under review exceeding by over 30 per cent. those of 1924.

How California Markets Its Citrus Fruits.

According to an announcement in the official organ of the Exchange, the Board of Directors of the California Fruitgrowers' Exchange has approved the Advertising Budget for the 1925-26 season. This Budget provides for the most complete advertising and sales promotion effort ever undertaken by the Exchange to increase consumer and trade preference for its products. The Budget, which is divided into three main groups—consumer advertising, trade work, and administration—involves an investment of $4\frac{1}{2}$ cents per box on oranges and grape fruit, and 7 cents per box on lemons. This is the same rate as has applied during the past two years. Present budget estimates call for an investment of approximately $685,984 for oranges and grape fruit, and $353,855 on lemons.

Of the budget, 70.3 per cent. is allowed for consumer publicity work. For trade work, including sales promotion, 24.3 per cent. has been reserved. While 5.4 per cent. provides for administration.

The major part of the appropriation for consumer advertising is spent in magazines, newspapers, posters, and educational promotion work.

The "Sunkist" fruits will be advertised in magazines aggregating a circulation of 100,000,000. The newspaper campaign on oranges and lemons is also far-reaching, covering a total circulation of 566,000,000.

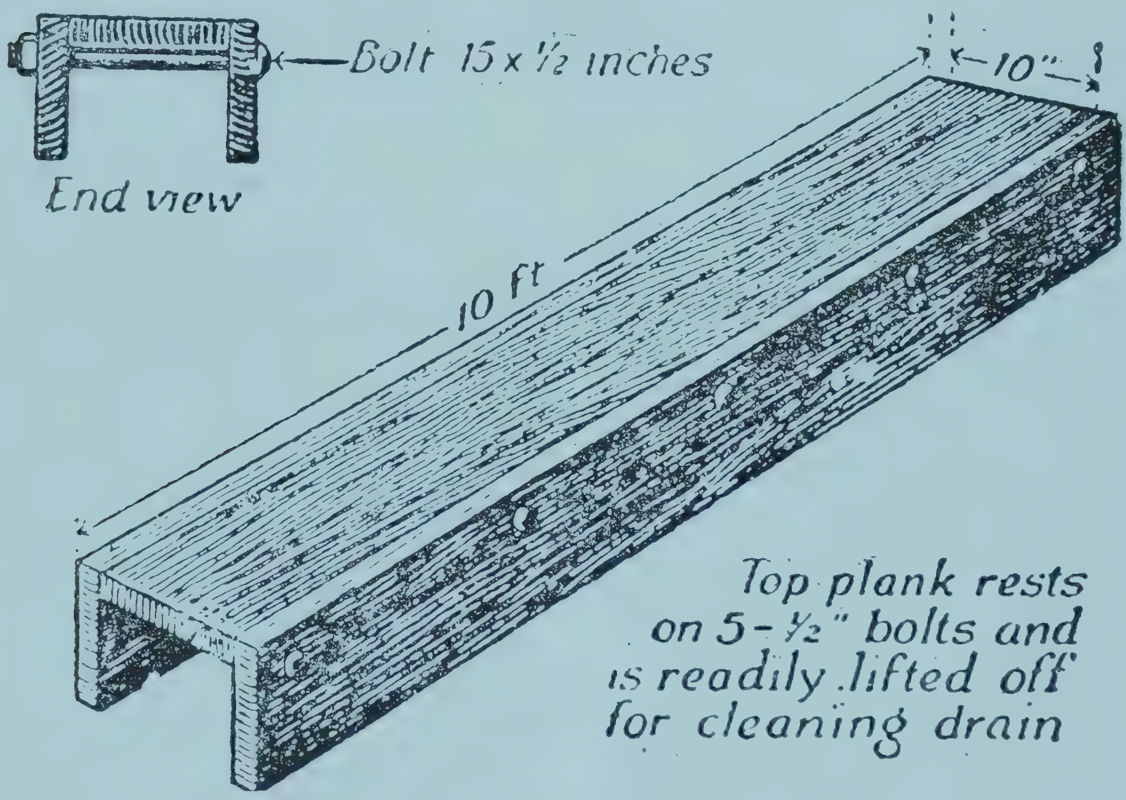
Educational promotion in the schools, hospitals, nurses, training schools, and with government extension workers will be intensified. The rising generation is to be well informed concerning California oranges—the fruit itself, together with the cultural, handling, and marketing operations.

Almost one-fourth of the year's budget is apportioned to help the trade stimulate sales. In the main office at Los Angeles a selected dealer list is kept, containing over 70,000 names of well-known merchants from all parts of America. To this list there are mailed each year informative literature and other data acquainting dealers with crop conditions and crop movements. In addition, sales and display suggestions are furnished. Dovetailing with this direct-by-mail service, nineteen dealer service men cover the United States and Canada to further better business and more scientific merchandising of perishables. These men have nothing to sell, but service. In doing this they meet and help over 40,000 dealers each year.

BOX CULVERTS.

A SUGGESTION FOR LOCAL AUTHORITIES.

A small box culvert with facilities for removing the top from time to time for cleaning out has been used with success in America. It is made of three planks ten feet long, two of them eight inches wide, and the other, which forms the top, ten inches wide. Five half-inch bolts, fifteen inches long, are placed through the side planks two inches from the top edges. Upon these bolts the top plank is set, as shown in the illustration.



SMALL PLANK CULVERTS THAT GIVE GOOD RESULTS.

Though the nuts are turned tight to prevent sagging and to insure unity and add strength, it is only necessary to dig down on the one side until the nuts are exposed. They are then loosened, and the top plank lifted out. The interior of the culvert is then easily cleaned with a spade.

Due to the fact that the wood is almost constantly damp, the threaded ends of the bolts should be treated with heavy oil, in order to prevent rusting.—"Country Gentleman."

Farm and Garden Notes for June.

Field.—Winter has set in and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by the copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sandpit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all cotton in the Central District should be consigned to the Australian Cotton-growing Association, Rockhampton or Gladstone, whichever is nearest; whilst those in the Southern areas should consign their cotton to the Association at Whinstanes, near Brisbane. All bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are requently received minus the address labels.

Kitchen Garden.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

Flower Garden.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in

position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, freesias, snowflakes, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE COASTAL DISTRICTS.

The remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States, if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash, or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry, the tree should then be given a good watering, and when the water has soaked in, the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder, and if the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas

during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay, or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bone dust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact, there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and unless there is a regular and abundant rainfall they should be watered regularly. In fact, in normal seasons, an adequate supply of water is essential, as the plants soon suffer from dry weather, or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt Area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt Area which are nothing more or less than breeding-grounds for pests, such as fruit fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now, where the land is ready and the trees are to hand, as early planted trees become well established before spring and thus get a good start. Be very careful what you plant. Stock to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and bodly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt and the vineyard ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress, otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as if allowed to remain longer on the tree they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. K. CHAPMAN.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1926.	May.		June.		Moonrise. May.	Moonrise. June.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·20	5·18	6·38	5·2	7·58	9·50
2	6·21	5·17	6·38	5·2	8·52	10·55
3	6·21	5·17	6·38	5·1	9·50	11·57
4	6·22	5·16	6·39	5·1	10·53	nil
						a.m.
5	6·22	5·16	6·39	5·1	11·58	1·0
6	6·23	5·15	6·39	5·1	nil	2·1
					a.m.	
7	6·23	5·15	6·40	5·1	1·2	3·2
8	6·24	5·14	6·40	5·1	2·5	4·3
9	6·24	5·13	6·41	5·1	3·8	5·2
10	6·25	5·12	6·41	5·1	4·11	6·1
11	6·25	5·11	6·41	5·1	5·12	6·58
12	6·26	5·11	6·42	5·1	6·12	7·54
13	6·26	5·10	6·42	5·1	7·13	8·45
14	6·27	5·10	6·43	5·1	8·14	9·32
15	6·27	5·9	6·43	5·1	9·11	10·14
16	6·28	5·9	6·43	5·1	10·4	10·53
17	6·29	5·8	6·44	5·1	10·54	11·28
						p.m.
18	6·30	5·7	6·44	5·2	11·39	12·2
					p.m.	
19	6·31	5·6	6·44	5·2	12·18	12·33
20	6·32	5·6	6·44	5·2	12·54	1·6
21	6·32	5·5	6·44	5·2	1·30	1·39
22	6·33	5·5	6·44	5·3	2·2	2·16
23	6·33	5·5	6·44	5·3	2·36	2·56
24	6·34	5·4	6·45	5·3	3·7	3·41
25	6·34	5·4	6·45	5·3	3·43	4·30
26	6·35	5·3	6·45	5·4	4·21	5·29
27	6·35	5·3	6·45	5·4	5·4	6·31
28	6·36	5·3	6·45	5·4	6·0	7·38
29	6·36	5·2	6·45	5·5	6·44	8·45
30	6·37	5·2	6·45	5·5	7·42	9·50
31	6·38	5·2	...	...	8·46	...

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

5 May	☾	Last Quarter	1 13 p.m.
12 ,,	●	New Moon	8 55 a.m.
20 ,,	☽	First Quarter	3 48 a.m.
27 ,,	○	Full Moon	9 49 p.m.

Perigee, 7th May, at 3 42 p.m.
Apogee, 20th May, at 3 48 a.m.

An occultation of the star Delta Capricorni will occur at an early hour on the 10th May when the Moon will be not far from the eastern horizon in a crescent shape tilted up, with the horns somewhat toward the right. The star will disappear behind the bright edge of the Moon about 3·20 a.m., and reappear about 50 minutes later on the dark edge of the Moon. A pair of binoculars or small telescope should make this an interesting spectacle.

The big planet Uranus will appear as a tiny star just below the much more brilliant Venus before sunrise on the 5th; binoculars will be required to see Uranus. The ringed planet Saturn will be in opposition to the Sun on the 14th and, rising about sunset, will be a beautiful object for observation in a telescope during the early hours of the evening.

About 9 p.m. on the 26th a conjunction of the planets Saturn with the Moon will occur when they are high up in the N.N.E. in the direction of Libra with the Scorpion on the right.

3 June	☾	Last Quarter	6 9 p.m.
10 ,,	●	New Moon	8 8 p.m.
18 ,,	☽	First Quarter	9 14 p.m.
26 ,,	○	Full Moon	7 13 a.m.

Perigee, 1st June, at 4 24 p.m.
Apogee, 16th June, at 10 18 p.m.
Perigee, 28th June, at 7 48 p.m.

About one hour before sunrise on the 2nd the star Gamma Capricorni will disappear behind the eastern edge of the Moon; it will not reappear until about the time of sunrise when it will be less observable. Mercury will be invisible in the early part of June being in superior conjunction with the Sun on the 5th, but towards the end of the month it will be visible somewhat indistinctly low down in the west about an hour after sunset.

On the 22nd at 2·30 p.m. the Sun will arrive at its greatest northern declination and the solstice will occur; the sun having reached its greatest northern declination, will pause and turn to come southward again. Saturn will be in conjunction with the Moon on the 22nd at 3 a.m., when Saturn will appear the uppermost at a distance of about four times the diameter of the Moon to the south. On the night of the 26th about 12·15 a.m., Omicron Sagittarii will disappear behind the lower eastern edge of the Moon and will reappear on the lower western edge about 12·30 a.m. Jupiter will be in conjunction with the Moon on the 29th at 9·39 p.m., when the planet will be about five times the diameter of the Moon to the left of it.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

The "Bunchy Top" Investigation Committee has presented its final report. Its findings and recommendations, which are of far-reaching importance to banana growers, are summarised in this issue. Mr. White has an interesting note on the destruction of Khaki weed. Cassava as a stock food is discussed by Mr. Brooks. The rearing and feeding of chickens are described by Mr. Rumball in an instructive note. Mr. Shelton's subject this month is the Tamworth pig, on which he gives a lot of valuable information; he has also a note on diarrhœa or white scour in pigs. A summary of an address by the United States Minister for Agriculture on surplus production and marketing problems is reprinted. Facts disclosed by veterinary research in respect to forage poisoning are also among reprinted matter. Though somewhat lesser in volume than usual, the June Journal contains much useful information and will be welcomed by readers generally.

Agricultural Conference—Meeting of Ministers.

An interstate conference of Ministers of Agriculture was held this month at Brisbane. The conference was convened by the Queensland Minister (Hon. W. Forgan Smith) and met in the old Legislative Council Chamber at Parliament House. Administrative and technical experts from each State also attended and took part in the deliberations, and assisted on special committees appointed to examine and report on several of the agenda proposals. The Premier of Queensland (Hon. W. McCormack) officially opened the conference, the purpose of which was to discuss rural matters and problems of common concern. The Hon. W. Forgan Smith was invited by unanimous vote to preside. Many matters of moment were considered, and agreement was reached on many important points. The setting up of permanent wheat standards, the placing of an embargo on black-grown maize, acceptance of uniformity in grade standards for exports, the stabilisation of the dairy industry and improvement in marketing methods, and legislative control of the use of sires for dairy herd improvement were among the more notable decisions of the conference.

Queensland's Needs.

"Queensland is a big State, with a small population and immense natural resources. Its great need is development. Queensland needs more people, and more scientific methods of exploiting its natural resources," observed the Premier (Hon. W. McCormack) in the course of his opening address at the Agricultural Conference. After welcoming the delegates from the other States to Queensland on behalf of the Government, he further remarked that they had met to discuss matters affecting the agricultural welfare of the whole Commonwealth, and, therefore, had very important work ahead of them. They would have to deal with many problems caused by a wide range of climate, and due to a wide sphere of agriculture, extending from the humid tropics to some of the coldest portions of Australia. He trusted their work would be so successful that the States generally would benefit as a result of the exchange of views by the Ministers and technical officers of an important part of their governmental system. One of the greatest problems facing Australia at present was how to make provision against prolonged dry periods. In the last analysis the problem of agriculture in Australia was the conservation of fodder and water. He hoped that when the visitors returned to their respective States, what they had seen of Queensland would enable them to dispel the notion, in some people's minds, that in Queensland they were "a crowd of bushrangers and Bolsheviks." The evidences of prosperity in Queensland and the remarkable progress made could not, he thought, fail to impress the visitors from the other States of the Commonwealth.

Protecting the Maize Grower.

"That consideration be given to the desirability of making further representations to the Commonwealth Government for an embargo on black-grown maize for the protection of the Australian industry" was the text of a Queensland motion at the conference of Ministers. The Chairman (Hon. W. Forgan Smith) declared that the maize industry could be extended to meet all the requirements of Australia. South Africa was a considerable grower of maize, and large quantities of that black-grown maize had, on various occasions, been dumped in Australia to the detriment of those engaged in the production of maize here. The Queensland Government had, for some considerable time, been in communication with the Federal Government in respect to duty on black-grown maize, and the Commonwealth had quite recently seen fit to accept Queensland's suggestions.

"It is felt by the Government of Queensland," continued the Minister, "that we, having adopted Australian living standards, these should not be menaced by our being forced into competition with countries whose standards of production are much cheaper, due to the low wage conditions that operate in those countries."

He thought it was a fair and sound proposition that that principle should be accepted. No one at that conference, he thought, would argue that Australia should be expected to carry on an industry in competition with coolie labour in other countries. That, briefly, was the principle embodied in the resolution. Certainly, the increased tariff granted by the Commonwealth recently would improve the position very considerably, but he was a strong believer in the principle of an embargo against the form of competition to which he had alluded. The motion was carried.

Stabilising the Dairying Industry.

The economical condition of the dairying industry was also reviewed by the conference delegates. The Hon. W. Forgan Smith moved, on behalf of Queensland, that consideration be given to the proposal to stabilise dairying by setting up butter and cheese boards in each of the States to act in collaboration with each other and with the Federal Dairy Produce Export Control Board in marketing.

The resolution aimed, he said, at stablising prices with the view of giving those engaged in the industry that decent standard of living, which they had a right to demand in a free community, and a scientific system of distribution. Every Government in Australia had considered carefully the principle of stabilising prices. In Queensland they had a Primary Products Pools Act, and had introduced a system of control which, in its limited application, had been of definite advantage to the farming community.

At the request of the Chairman, the Director of the Queensland Producers' Association (Mr. L. R. Macgregor) addressed the conference. He said the Queensland Government of late years had enacted a very comprehensive code of agricultural legislation, which covered the marketing of primary products. The farmers were being encouraged to avail themselves of the most modern methods of co-operative production, and to combine together on the basis of compulsory agricultural pools. They had in Queensland twelve marketing boards constituted for the purpose of bringing about a more orderly system of marketing of the products concerned. The

policy was to encourage the producers to investigate their own problems and to assist them in their marketing activity. Queensland had agreed to give the Paterson scheme a trial, and in January last a change came over the butter situation. To prove this he directed attention to a graph showing the weekly prices of butter on the local, interstate, and overseas market in 1925, and for the first four months of the current year. He demonstrated that for the first time for many years local prices were about 9s. 4d. a cwt. (1d. a lb.) higher than prices on the London market. Comparing the beginning of 1926 with the beginning of 1925 they would find the overseas market about par, whereas the local market prices of 1926 were about 56s. a cwt. (6d. a lb.) higher than 1925, the advantage to Victoria being particularly noticeable. Of course, the levy of 1s. 2d. a lb. to effect equalisation had to be taken into account. The benefits of the Paterson scheme were clear, but would the scheme, as constituted on a voluntary basis, hold together? One reason why they asked that stabilisation should be effected by legislative authority was that voluntary schemes were loosely held together. Stability meant the bringing about of regular, even conditions, and more stable conditions of prices.

The proposal was debated generally. Every delegate desired to see an improvement in the conditions of the industry, but there were differences of opinion as to how improvement might be effected. In the course of his reply, Mr. Forgan Smith said the object of the motion was not to justify the Paterson scheme, which was merely an expedient of the dairymen of Australia to cope with conditions as they found them. From the point of view of hard and fast economics that scheme could be attacked from various standpoints, but the dairyman had used the only power at his disposal to improve his conditions. He himself took the view that no one had the right to get any commodity cheap, if its cheapness depended on the sweated labour of the men, women, and children engaged in that industry. The dairymen of Australia, in his opinion, were in the same position as working men without organisation. The motion in a slightly amended form was ultimately carried.

Eggs—Uniform Grade Standards.

The conference agreed to the principle of uniform grade standards for eggs in the States, and for export; and also the inclusion of eggs in shell, and in pulp in the Commonwealth Commerce Act. The Chairman (Hon. W. Forgan Smith) said that there was a great field for the extension of the poultry industry in Australia. It was not generally known that it was the fourth most valuable rural industry in the United States. That showed the capacity there was for its extension in Australia. Up to the present, eggs for export had not been included in the Commerce Act, and they could consequently be exported without inspection or a uniform grade being insisted upon. He had received at least three deputations since he had been Minister for Agriculture, with a request, on behalf of poultrymen, that grades for export be established. A department committee was instructed to draft uniform standards, and report its decisions to conference.

The White Man in the Tropics.

Australia, and particularly Queensland, provides a convincing test case for those who still cling to the extraordinary belief that the tropical areas of this continent cannot be developed without coloured labour. Dr. R. W. Cilento, Director of the Australian Institute of Tropical Medicine, in his recent work, "The White Man in the Tropics," gives many very interesting facts that are sure to shock the dogmatising theorist on conditions of living north of Capricorn. Dr. Cilento points out, "the white man in tropical Australia is in different circumstances from the white man in practically every other tropical location. Elsewhere in the tropics the white man is an official, a missionary, an overseer of labour—forming an almost negligible white superstratum on the black mass of a native population teeming with disease. In tropical Australia the native population is almost negligible, and the white man performs every kind of labour, from the most menial to the most intellectual."

It used to be held that the white man could not live in the tropics if he worked; Dr. Cilento shows that the white man cannot thrive in the tropics unless he works. "The tropical areas of Australia are unique in that they have no teeming native population, riddled with disease, but are occupied by many thousands of pure-blooded European settlers (103,000 along the eastern coast of Queensland alone). These settlers make up altogether the largest mass of a population, purely white, settled in any part of the tropical world, and represent a huge, unconscious experiment in acclimatisation, for here the white settler is not in a position of lord of a native race, but is simply a working man carrying out every occupation." Having shown by medical research statistics, culled carefully over many consecutive years, that the North is not necessarily inimicable to health, Dr. Cilento deals drastically, however, with the need of reform in tropical housing.

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Select Good Seed.

During planting operations reject all seed showing tunnels of the weevil borer, or that may have been derived from a locality known to be borer-infested. Such seed often harbours eggs or young larvæ, and after planting same the latter may devour so much of the "sets" as to make them worthless for support of the young shoots, or perhaps result in their dying later on, thus causing unsightly misses. Moreover, by means of such diseased seed, the weevil often obtains a footing in clean localities, and once becoming established is not easily got rid of.

Should a grower wish to save seed of a valuable variety of cane chancing to show evidence of the presence of this borer, such sets should be immersed for half an hour before planting in water heated to a temperature of from 55 to 60 deg. Centigrade.

When using top-plants of Badila or similarly soft varieties, keep a lookout for moth borers, the presence of which is betrayed by tunnels opening on to the rind, blocked more or less by webbing and pellets of excreta.

How to Fight the Weevil Borer.

The following simple remedies are within the reach of all growers:—

(1) *Burning the Trash.*—Immense numbers of these beetles and their larvæ can be destroyed in this way on plantations where fly parasites of this borer have not been liberated.

(2) *Stripping the Trash.*—This can be carried out on areas where tachinid flies have been established, and is recommended as serviceable, since this weevil usually hides behind loosened leaf-sheaths, and, being a lover of seclusion and darkness, is repelled by additional light and air admitted between the cane rows.

(3) *Bait Traps.*—These consist of pieces of split cane about 18 in. long, in number from fifteen to twenty, which are placed in little heaps on headlands adjoining borer-infested cane, and loosely covered over with débris sufficient to keep the cut surfaces from drying up too quickly. We have found it a good plan to lay these heaps in excavations (about 12 by 20 by 8 in. deep) made in the unbroken soil, as by this method the cane retains its moisture and emits the attractive odour of fermentation for a longer period, and also encourages the beetles to remain in the heaps and oviposit in the pieces of cane. Such traps should be visited every second day to collect and destroy the weevils. Later, when baits need renewing, the old pieces should be burnt, in order to destroy eggs or young larvæ.

Combating Grasshoppers.

Indications at present point to the possibility of trouble arising this season from grasshoppers. Fortunately, the occurrence of this pest is confined to small areas; and if taken in time, while the hoppers are small and unable to fly, serious damage can usually be prevented. The following methods of poisoning these insects are recommended:—A poison bait that has proved very successful is made from 100 lb. of coarse bran (the coarser the better), with 4 lb. of finely powdered crude arsenic or Paris green, 4 lb. of cheap-grade granular dairy salt, 2 gallons low-grade molasses, 3 oz. amyl acetate, with 10 to 12 U.S. gallons of water. If bran be not obtainable, sawdust might be substituted. When large amounts of the bait are being used the arsenic should be added to the liquid ingredients instead of being mixed with the bran while dry. Another good poison bait is given in our Entomological Hints for June, 1925 (see "Queensland Agricultural Journal" and "Australian Sugar Journal" for month of June). Spraying a strip of grass around or in front of an invading swarm with 1 lb. sodium arsenite, 4 lb. treacle, and 16 gallons water has also been advised, it being important that the poison and the treacle should be dissolved separately in hot water and mixed when cold. To treat six acres one needs 28 lb. arsenite and 1 cwt. treacle.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (21st May, 1926) from Mr. E. Jarvis, Entomologist at Meringa, near Cairns:—

The following progress report is submitted dealing with the past and present economic position of this Sugar Experiment Station, and with our work here during the period April to May, 1926:—

Referring very briefly to the establishment of this Entomological Laboratory at Gordonvale in the year 1911, canegrowers will doubtless recollect that at this initial stage of the cane-grub investigation our work was directed chiefly against the so-called "grey-back cockchafer," although incidentally embracing also research work regarding larvæ of a few other closely related species of scarabæidæ, some of which were known to cause appreciable damage to cane. Before attempting any control work, however, it was first necessary to learn something about the life-history and ecology of these beetles; and accordingly three years were devoted to such essential studies. These were followed up in 1914 by an aggressive campaign, when numerous forms of repression were instituted with a view to combating both the grubs and beetles of our notorious cane pest *Lepidoderma albohirtum* Waterh.

During this second period a preliminary list was prepared of all insects observed to affect sugar-cane in the Cairns district; comprising those species attacking the leaves, boring the sticks, or devouring the roots (see Bulletin No. 3, Division of Entomology, 1916).

The results of subsequent investigations during a third period, extending from 1917 to 1921, have been published in Bulletins Nos. 7, 8, 10, 15, Division of Entomology; these, in short, consisting (1) in efforts to determine the effect of white arsenic on cane grubs, when sprinkled in drills before planting the sets, or buried alongside cane rows on grub-infested areas, and (2) the establishment of *Ceromasia sphenophori*, a dipterous parasite of the weevil borer (*Rhabdocnemis obscurus*) in the Cairns and Babinda districts.

It may be mentioned here that specimens of these useful Tachinid flies were procured for this purpose from Mossman, where they had previously been liberated during 1910 by Mr. F. Muir, in fulfilment of an agreement made between him and Mr. Henry C. Tryon just prior to the introduction of this parasite by the former entomologist from New Guinea into Hawaii.

During the last five years (constituting a fourth period) from 1921 to 1926, our general outlook and sphere of operations has naturally widened considerably, and at present deals with many phases of control work, designed to combat the ravages of cane insects admitted to be of primary economic importance.

Although about thirty-three different species are known to be more or less injurious to this crop in the Cairns district, about seven only of these should be held responsible for serious damage. Our efforts, indeed, are at present directed chiefly against four insects, viz., the "grey-back cockchafer" (*L. albohirtum*); the "weevil borer" or "cane borer" (*R. obscurus*); French's cane beetle (*Lepidiota frenchi* Blackb.); and the Giant Termite (*Mastotermes darwiniensis* Frogg.). Additional species which have of late furnished cause for complaint from growers in other sugar-growing centres, and may prove troublesome in the future, are:—*Pentodon australis* (stem gauger); *Metoponia rubriceps* Macq., a stratiomid fly (some species of which are termed soldier flies) and *Monocrepidius sp.* (wireworms).

About twenty different control methods applicable to the grey-back cockchafer have been tested at this laboratory from time to time; many of which, however, although of great scientific interest, have gradually given place to such cheap and simple remedies as fumigation of the grubs, or wholesale capturing of the beetles in time to prevent oviposition.

During the last three years this pest has been under effective natural control here, owing to a fortunate occurrence throughout certain critical stages in its metamorphosis of adverse climatic influences; which, by retarding and in some localities preventing the emergence of vast numbers of these beetles from their subterranean pupal chambers, have time and again operated as a severe check on its numerical increase.

Trap-Trees for Cane Beetles.

Among various methods of combating *albohirtum* (grey-back) during its imago or perfect condition, that of collecting the beetles deserves serious consideration. In the early days of canegrowing on the Mulgrave and Hambledon areas it was customary during the beetle season for the mills to encourage such work, the usual procedure being to shake these cockchafers from their feeding-trees at break of day, while too torpid to take to wing. As previously pointed out in 1917 (Bulletin No. 17, pages 43 and 44) collecting to be of any decided benefit should not only be

practised systematically and on an extensive scale, but also be under direct supervision of an entomologist. Certain drawbacks attendant on indiscriminate collecting, coupled with labour difficulties, may, I think, be held responsible for the abandonment of this control method throughout the Cairns district. Much good might result, however, from individual collecting by canegrowers on land subject to annual invasion from grey-back beetles. Some years ago (1921) the present writer, when reporting on the value of two native figs, *Ficus pilosa* and *F. nesophila* (favourite food-plants of this cockchafer), suggested the advisability of planting these trees as natural traps, that would attract beetles away from the cane, and facilitate the collecting of same (Bulletin No. 17, page 64). Such trap-trees could be planted, say, about 600 ft. apart along headlands, and pruned occasionally to keep them low and induce spreading. *Ficus pilosa* has been successfully raised here from seed this season by the Assistant Entomologist, Mr. A. N. Burns, and we now have quite a number of plants, which twelve months hence will be young trees suitable for distribution.

It may be of interest to state that in Mauritius during the 1923-24 season 52,000,000 beetles of *Lachnosterna* (*Phytalus*) *smithi* were collected during the year. In one locality collecting these beetles by hand from cane-furrows considerably reduced the infestation. In the Phillipines during 1925, collecting by hand of the grubs of the cane beetle *Leucopholis irrorata* proved the best method of dealing with this pest, and is especially recommended in canefields where ratooning is rarely if ever practised. In the ''Planter and Sugar Manufacturer'' for July, 1925 (Volume LXXV., page 49), some interesting tables are given showing the numbers of grubs of *Lachnosterna* collected during the years 1918 to 1923, including the expenses and cost per hundred. ''On referring to these tables it will be noticed,'' says Mr. E. H. Barrow, ''that the numbers collected were decreasing up to the date when collecting was stopped, and began to decrease when collections were again taken.''

Effect of Late Emergence of Beetles.

At the present time (13th May) grubs of *albohirtum* are still feeding vigorously in some localities, having only just entered upon the third instar. This means that grub injury may yet show up on plantations believed to have escaped infestation, seeing that these grubs will continue feeding until the end of June.

An emergence took place this season about 3rd January, instead of some time in November or December, as usually happens during normal seasons. Our only other record for January was in 1919 to 1920, when a primary flight occurred on the 15th of that month.

During 1918 these beetles made their first appearance on the 15th October, which was, of course, exceptionally early.

As previously reported (Bulletin No. 19, page 26) beetles forced to endure prolonged confinement for several weeks in underground pupal chambers are likely to suffer an appreciable loss of vitality, so that when at last able to escape from the soil they are unable to withstand a spell of excessive heat, and should such conditions chance to occur before oviposition while they are still in the feeding-trees millions of specimens may perish.

CANE PESTS AND DISEASES.

Mr. N. L. Kelly, Assistant to Pathologist, reports (*24th May*, 1926):—

Mosaic disease occurs in every canegrowing district of Queensland and New South Wales. Its spread in the past has been due to the fact that many growers do not know either its symptoms or the losses it causes, and thus do not attempt to control it.

Losses.—These losses are considerable. Every mosaic-infested set planted produces a stool which may be only half the weight of a healthy stool, in susceptible varieties, *e.g.*, Shahjahanpur 10, Gingila, and to a lesser extent M. 1900 Seedling. In other varieties grown, the loss is, generally, not so great, although one authority estimates 40 per cent. as the average loss. The loss in a ratoon crop, quite apart from the spreading of the disease, is usually larger than that in the plant crop.

Symptoms.—The first noticeable feature is the presence of a mottling on the leaves—patches of light-green or light-yellow alternating irregularly with patches of the normal darker green. As spots or streaks due to other causes often appear on older leaves, the mottling should always be sought on the younger leaves. By transmitted light these appear very translucent in the more unhealthy areas. In thoroughly infected shoots symptoms may also be seen on the stem. This is both shortened and marked with colourless longitudinal streaks, and, in badly affected cases, the internodes are contracted and ''scored'' longitudinally.

Cause.—The disease is caused by an ultramicroscopic organism—a virus. The lighter-coloured patches on the leaf—the more unhealthy areas—are the portions where the virus has partially decomposed the colouring matter of the leaf—the chlorophyll.

Spread.—Mosaic is spread by planting diseased sets.

Infection is carried by the corn aphis (*Aphis maidis*), which carries the virus in its mouth parts—(1) to healthy cane; (2) to the following grasses:—Corn, sorghum, Native sorghum, Johnson grass, Rat-tailed grass, Wild millet, and Summer grass, on all of which the corn aphis has been found, and all of which contract a Mosaic disease.

Control.—(1) Eradicate (dig out) infected stools from all lightly-infected fields. This operation is most efficiently performed when the cane is young, and quite prevents the spread of the disease. The nearer ''ploughing out time'' it is, and the more heavily infected the crop is, the less payable, of course, does eradication become.

(2) Seed selection.—Avoid, as a source of seed, any stool, one of whose stalks is infected; for the infection soon spreads from one to every stalk in a stool.

(3) Resistant varieties.—Eradicate very susceptible varieties, especially Shahjahanpur 10. Every stool of Shahjahanpur 10 that the writer has seen has been infected with Mosaic.

(4) Keep corn, and the above-named grasses as far from the canefields as possible.

DISTRICTS VISITED.

Bauple.

This district is not troubled very much with serious diseases. Gumming is present on a few farms. Eradication and seed selection alone should eliminate this disease. Mosaic is more widely distributed, and is causing losses in M. 1900 Seedling. This variety here, and elsewhere, is also troubled somewhat with Foot Rot (or Root Fungus disease or Peg Leg). Foot Rot can only cause damage when the cane is first weakened from some other cause, *e.g.*, drought, insect attack, incomplete preparation of the land, &c. The fungus attacks the cane from the soil, in which it has been living on rotting stools, &c. It can be largely destroyed in a field by careful tillage, and by a ''green manure'' crop; otherwise by long fallowing before planting.

Maryborough.

Gumming was found on a few farms in The Pocket. Fiji disease, which was described in the writer's last report, was recognized, for the first time in the district, at Tinana and Bidwell. Control measures are elaborated in the last report. The careful selection of seed must be practised until the disease is entirely eradicated. Mosaic is to be found on the majority of farms at Maryborough, Yerra, and Pialba, and always where Shahjahanpur 10 is growing or has been growing. This variety is for this, if for no other reason, to be strongly condemned. The Island Plantation appeared particularly free of disease.

Isis.

This district has just passed through one of the worst droughts in its history, consequently those farmers that are suffering most from diseases are often least able to eradicate them. Gumming disease was found at Goodwood, North Isis, Cordalba, and Horton in D. 1135. It is appearing in two stages:—

(1) In one-year old cane the ''gum streaks''—streaks in the leaf—formed after the small quantity of rain at Easter-time are showing up well. They are probably that type of streak due to the bacteria rising with the sap from the infected vascular bundles of the stem. In any case, it behoves every farmer concerned to acquaint himself with these ''gum streaks,'' as when they are showing, they are the speediest and most valuable means of identification known. Obviously, early identification tends towards economy in control.

(2) In two-year old cane gumming is now becoming acute, in most cases. This is brought on by drought and approaching maturity. The top of the stem has died, and the rot is advancing downward. The ''eyes'' near the top have shot. On splitting the stem vertically a reddening of the veins—vascular bundles—is noticed, which becomes less pronounced towards the foot. A segment cut from the top ''sweats'' gum readily. On the ends of segments cut from a lower portion of the stem it is very difficult to detect the gum globules. Gumming was not located in M. 1900 Seedling, but that variety is susceptible to the disease. Since the disease is scattered somewhat sparsely, eradication and seed selection, as previously elaborated, are sufficient measures for its control.

Mosaic disease is causing losses in all varieties grown. The reader is referred to previous remarks on this disease.

Foot Rot is highly prevalent, mostly in M. 1900 Seedling, but also in D. 1135, Q. 813, and H.Q. 285. Control measures are mentioned in the remarks on the Bauple district.

Iliau was found in one field of plant M. 1900 Seedling at Goodwood. It attacks only young cane. The leaf-sheaths are very tightly cemented to the stem by a white felt of fungus mycelium. On the outer side of the inner leaf-sheaths are to be found small eruptions, with black coiled masses projecting, which contain the fruiting bodies—conidia.

The showers now falling are washing these into the soil, so that next year's ratoons, from the uninfected stools nearby, will almost certainly be attacked, though the percentage of infected stools killed out will probably be smaller.

Control.—Plough out the infected and a small buffer area, and give the land thorough preparation before replanting.

Knife Cut was found in one-year old D. 1135, and to a much smaller extent in M. 1900 Seedling. According to the observations, over a period of ten years, of Mr. G. F. Schmidt, North Isis, in dry times a joint near the top becomes contracted. Soon after the return of better growing conditions a bulge appears on one side of this joint, followed shortly by the transverse break or cut on the other. One fact is almost established, that the faces of the wound were once in contact. Various theories as to the cause have been propounded but nothing has yet been proved.

Mr. R. W. Mungomery, Southern Assistant Entomologist, reports (15*th May*, 1926):—

During April Nambour, Beenleigh, Booyal, and Dallarnil districts were visited, and inspections of these cane areas were carried out.

Nambour and Beenleigh.

Diseases in cane call for greater comment and a much more serious consideration from growers at Nambour and Beenleigh than actual insect injury, and, without considering for the present the importance of insects as factors in the spread of Mosaic disease, and also in regard to their being suspicious agents in the spread of Gumming disease, any direct attack from insects and losses accruing therefrom must necessarily take a second place to the losses caused by diseases in these districts.

Maggots in "Dead Hearts."

When on the subject of the Gumming disease, it may not be out of place to add here, that in the final stages of this disease when the plant begins to die, the heart usually dies first and death then follows from the top downwards. When in this condition, if the dead central heart be pulled out it will be found to harbour several small long dipterous maggots in all stages of development, up to about ½ inch in length, and sometimes their golden brown puparia may be found scattered through the rotting fibres. These maggots are, in many cases, often mistaken by farmers for the real cause of the death of the cane, but their presence in these dead leaves is purely of a secondary origin, the adult flies being influenced to oviposit here, by the attracting odour of the decaying vegetation. This state of affairs also happens in the case of "dead hearts" caused by injury of the large moth borer *P. truncata* and other similar insects, as well as from mechanical injury due to scarifiers and other implements used in cultivation.

These maggots are the larvæ of flies belonging to the Micropezidæ and other closely allied families, and the writer has bred specimens of these flies in North Queensland, and, although they may differ as regards species, the habits of those occurring in the South are essentially the same as the Northern species. Therefore, these maggots themselves should be of no great alarm to growers, but should serve as Nature's way of indicating that other factors are present which are causing or contributing towards the death of the plant.

Other Injurious Insects.

"White grubs" are causing minor damage in parts of the abovenamed districts, chiefly to young plants when they are first planted up in spring in land that has previously been under paspalum grass, but also in a few instances these grubs have been causing damage to young ratoons in the Rosemount area and a considerable reduction in tonnage has resulted. The identity of these grubs is unknown, but they are probably the larvæ of an Anoplognathid, and arrangements will be made as soon as possible to breed them out and to determine which beetle, out of the many scarabæidæ known to occur there, is responsible for their appearance in the canefields.

No soil fumigation tests have yet been tried and the only method of dealing with them that has proved successful in regard to the plant crop is to first plant up some

other crop such as arrowroot or beans which do quite well in these localities, to hand pick the grubs when ploughing these crops out, and to plant up with cane as usual in the following year. Carbon bisulphide should be used with discretion, preferably in very small quantities, for larger doses are apt to be too severe on the young plant cane, and in these moist swampy soils paradichlor would scarcely evaporate quickly enough to have any appreciable effect on the grubs, though the success that has followed its use in other places certainly warrants its being tried here. In the case of ratoon cane referred to above, this might well be treated with carbon bisulphide injected with a Dank's injector and produce no ill-effects on the cane.

P. furfuracea and *L. grata* were found on newly ploughed paspalum land at Kureelpa, but they are apparently not responsible for the damage they occasion in the Childers and Gin Gin districts.

A so-called "black beetle," which, according to its occurrence and the description given by various growers, may be *Pentodon australis*, has been eating the eyes of the sets and boring into the shoots just above their junction with the parent set. This injury is mostly confined to the newly planted paspalum lands and other cultivated lands adjoining these, resulting in bad "strikes." As very little ploughing was going on during the time of my visit, and none of these beetles were taken, I was unable to confirm the identity of this beetle.

Booyal and Dallarnil.

These districts are at present suffering severely from drought, and although at times like this, where actual injury from insects did occur, it would be hard to differentiate between the losses due to insect damage and that due to dry weather, it is safe to say that in this case where harmful insects are so noticeably absent, losses are solely due to the dry weather.

The Bud Moth *(O. glycyphaga)*.

These moths, whose larvæ injure the buds or "eyes" of sugar-cane, were rather plentiful resting in their characteristic attitude on the underside of the cane leaves, and growers should keep a careful watch on all cane used for plants, for in many cases the eyes are so badly bored into that they will not shoot, hence a bad "strike" often follows a careless selection of seed cane.

FIELD REPORTS.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (20th May, 1926) from the Southern Field Assistant, Mr. J. C. Murray:—

Booyal.

The crops here are backward and the prospects for the coming season are not of the best. Much of the plant and ratoon cane made a good start, but there has been little growth since Christmas.

Regarding results from fertilising, behaviour of varieties, and losses due to parasitic agencies, there is nothing of importance to comment upon since last visiting this district.

Points that farmers should consider in making local experiment in regard to cane varieties are—

(1) Resistance of cane to grub attack, frosts, or disease.
(2) Root system, whether large and spreading or small and bunched.
(3) Nature of soil particular varieties thrive best in (this is an important point).
(4) Nature of soil whereon canegrowing appears to suffer most from gumming disease, if present.
(5) Striking, stooling, and ratooning qualities.
(6) C.C.S. content.

Dallarnil.

This district has suffered a great deal from the dry weather. A very considerable amount of effort has been put forth by the growers in Dallarnil, and it is unfortunate that they should have encountered such a dry spell this year. However, if they do not take a heavy tonnage off, there should be a heavy crop for the following season.

Farmers here during the next planting period are recommended to be careful in plant selection, and not use disease-affected sets.

Bundaberg.

This important sugar centre is at the present time, from a sugar-growing view-point, backward through not having had sufficient rain since Christmas. The crops are green, however, and the farmers have had good results from their recent planting operations, while the general outlook is not altogether unpromising either for the coming season or for 1927.

Regarding cane varieties, those making a good showing are M. 1900 Seedling, H.Q. 285, N.G. 40, N.G. 22, Q. 813, H. 227, and Black Innes. The latter cane is suffering a good deal from Mosaic disease. Gumming disease is in evidence, though more advanced in Clark's Seedling than other canes.

The following field observations were made with regard to the gumming of sugar-cane:—

(1) That yellow shotty soils or soils with clay subsoils have a larger percentage of gum-carrying cane than red volcanic.

(2) That a large percentage of soft-skinned canes "gum" readily.

In relation to manures, growers are obtaining further positive results from the use of potash. In regard to the use of this manure, it is not altogether advisable to use it alone, but mixed with other manures. Potash should be used as an auxiliary rather than a sole manure.

There is a considerable amount of circumstantial, though not conclusive, evidence to show that potash has a harmful effect on earth parasites, such as wire worm, snails, &c.

The following descriptions of varieties about which there is some doubt may be of use to farmers in this district:—

N.G. 40.—A bright green cane with claret-purple longitudinal lines and stripes, internodes about 4 in. long; good stooler. Not known to arrow.

N.G. 40 Sport.—A green-coloured cane of medium thickness with a red to brown blush; internodes from 3 to 4 in. long and barrel-shaped; erect habit; good stooler and free trasher. The Sport is not such a good cane as the original N.G. 40.

N.G. 103.—Olive-green coloured cane, with light red stripe, medium thickness, heavily waxed, erect habit, internodes 3 to 5 in. long, barrel-shaped; eyes medium and acute; foliage medium; good germinator and stooler; arrows.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (22nd May, 1926) from the Northern Field Assistant, Mr. A. P. Gibson:—

Innisfail District.

Goondi, Mourilyan, and South Johnstone Sugar Mill areas were inspected last month. Last season 64,299 tons of sugar were manufactured in the Johnstone River sugar district. The Adelaide Steamship Company's mosquito fleet speedily removed all with the exception of 18,369 tons; this was taken away from Mourilyan Harbour by larger boats.

Seasonal.—Up to the fourteenth day of April splendid rains fell, and since, warm dry days followed by refreshing nights have been experienced.

Rainfall.—January, 13.93 points; February, 8.51; March, 17.43; April, 13.76; to 15th May, .88; total 54.51. The total fall to date is much below the general average, although enough to maintain crop growth. Should the winter be cold, and the rainfall scanty, the estimates given below will not be realised.

Crop Prospects.—At present, the crop is looking well, but in parts backward, the average length of stem would be from 3 to 4 ft. and carrying a lengthy top, therefore making it difficult to determine with any degree of certainty the district's grand total tonnages likely to be harvested. Unforeseen things such as weather, early arrowing, and pests may have a beneficial or detrimental influence on the present hopeful conditions.

Approximate Mill Estimates.		Commencing Crushing Dates.
Goondi	155,000	16th June.
Mourilyan	135,000	27th May.
South Johnstone ..	210,000	12th May, now delayed to 19th May.
Tully	135,000	1st July.
Estimated total tons	635,000	

Cultivation.—Ideal conditions prevail for all classes of outside work. The cultivation of crop interspaces was being continued on the more recently planted areas and backward ratoons. Light animal-drawn implements in use were making little impression in some of the refractory soils; such cohesive interspaces would be more profitably tilled by the use of a subsoiler, thereby permitting access of the two essentials—water and air—necessary for quick and healthy growth. Many motor and animal-drawn ploughs were engaged turning in satisfactory leguminous crops, and preparing the resting areas preparatory to the coming planting operations. In some instances the resulting work was poor, the cut is sometimes too wide, leaving under the surface a great unploughed ridge. It is common to find the supposed ploughed out old stubbles of a previous crop growing strongly in the subsequent plant area. The D.I. plough is becoming popular, more especially for the turning in of vegetable matter.

Planting.—Several farmers were planting, the foremost idea being to have this operation completed prior to harvesting operations. Some paddocks would have benefited had they been ploughed again before planting. The practice of opening cane drills too far in advance when planting should not be encouraged. Cane considered too expensive to cut by the harvesting gangs is often invariably retained for plants. Nothing but the best and disease-free should be planted.

Varieties.—Many varieties are raised, the most favoured and profitable all-round cane is N.G. 15 (Badila); this should be grown on the good to medium soils, and 7 R 428 (Pompey) and Q. 813 on the poorer soils. On the richer lands they should be classified among the disapproved varieties. Here the growth is too rapid and the cane tumbles, resulting generally in a low commercial cane sugar content.

Isolated patches of cane, more particularly that growing on volcanic red soils, fail to grow cane in comparison with the average crop. Such patches after harvesting often develop yellow stripe in the leaf quite distinct from Mosaic disease. This may be due to the absence of chlorophyll, or something harmful in the soil. Soil samples of the good and the bad were taken for the purpose of finding the reason why, and what to apply.

Arrowing.—The season, the variety, and time of planting mainly influence arrowing. The first indication of this was observed in the variety 7 R 428 (Pompey) on the fifth day of April. Since, all varieties have speared, N.G. 15 (Badila) at present to a much lesser degree. Fully developed flowers were showing a month later. During the next two weeks fully developed flowers will be plentiful when the growth of this cane will cease.

Leguminous Crops.—Mauritius beans and cowpea are mainly grown for the purpose of helping restore the depleted soil humus. The former mentioned is a slower maturer, and is more difficult when old, to plough under in the friable red soils. Rice beans—a recent introduction—have given promising results in the experiment stages. A small area of this and Mauritius bean were sown side by side, at the end of February, 1925, for comparison; the latter was completely destroyed during the prevailing wet conditions early in its growth, whilst the rice bean flourished and produced a satisfactory crop of green matter, maturing in June. At present a crop of the aforementioned two crops were seen growing side by side on a Goondi farm; the rice bean in every respect appeared superior to the Mauritius bean, and was heavily covered by a buttercup yellow flower. Small areas had been carefully measured and the surface crop weighed, with the following results:—Mauritius beans at the rate of 7½ tons vegetable matter per acre; rice beans at the rate of 15 tons vegetable matter per acre.

Cane grubs.—Isolated patches of cane throughout this extensive district have suffered more or less from the cane grub destruction. Garadunga and Daradgee volcanic red soils, and the alluvial deposits at 8-Mile, South Johnstone, were the worst affected. Three distinct types of larvæ were located under the devoured cane stools, clearly indicating three flights of the mealy bug. The estimated cane tonnage destroyed by the pest at Goondi last year alone was 6,000 tons, this year it is greater and could easily be put down at 15,000 tons for the district. Fumigants have been used in the soil, opinions differ very much regarding its successful use or otherwise. Two farmers at Daradgee were picking up at the rate of two and a-half kerosene tins of grubs per man per day, for which 6d. per pint and 1s. per lb. for beetles was being paid. Green Muscardine fungus, one of the grub parasites, was observed covering many larvæ exposed by the ploughs in the Mourilyan alluvial soils. Unfortunately, farmers were picking up the affected grubs, therefore freeing the soil of this valuable vegetable parasite.

Some action should be taken to stop people shooting the sugar-farmer's friend, the "Ibis."

The weevil beetle borer (*Rhabdocnemis obscurus*): This notorious pest is spreading at an alarming rate, more especially in the South Johnstone area. If not speedily controlled may cause most serious losses, more especially in the softer rind varieties. To retard its progress, it is urgent and important that we speed up the breeding of the Tachinid fly—one of its present known and most valuable parasites. At Silkwood some 2 ft. of badly-decayed stem of 7 R 428 (Pompey) were examined, and found to contain 30 beetles, 22 larvæ and 9 cocoons, three of which fortunately contained eggs of the Tachinid fly. Eggs of this parasite were also located on a farm at Jaffa. Many cocoons in the South Johnstone area were examined, all of which contained larvæ all the way up from the pupating stages to the fully-matured beetle. Cane recently trashed along the railroads for fire breaks was being severely attacked by the borer.

Diseases.—Leaf scald and a fungus on N.G. 15 (Badila) were observed, the latter tightly binds the embracing leaf-sheaths to stem, thus causing a sickly light-red colour and reducing the sugar content. When this leaf is removed the cane, on exposure to sunlight, quickly regains its dark colour. On no account should such affected canes be used for seed. The mill chemists are busy testing canes prior to commencing grinding operations; the sugar content of same is turning out quite satisfactory considering the time of the year.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (18th May, 1926) from the Southern Field Assistant, Mr. E. H. Osborn:—

During the past four weeks the Mackay area was visited, more attention, however, being paid to the North side areas than elsewhere, although some time was also spent on portions of the Racecourse area, and a few brief visits were paid elsewhere.

With regard to the cane generally, it had not had sufficient moisture to enable it to make its best growth, and was, although green and healthy looking, rather backward. This applies especially to the plant. As for the ratoons, they looked fair where they had been well cultivated, but very poor in many other cases, the ground being very hard in the interspaces and the weed growth heavy.

Referring to weather conditions, the following rainfall was registered at the Mackay Post Office:—January, 3.40; February, 4.05; March, 8.10; April, .90; May (to date) .19; total 16.64 in. This gave a total of 16.45 for the first four months of the year, against 33.57 in. for last year, 34.57 in. being the average fall for the past five years in the same period, so naturally the crops have felt it.

In speaking of cultivation to many growers, remarks were made by some of them that, with sugar at such a low price, they could not afford to cultivate as well as they wished. That is certainly so if a grower is trying to cultivate too large an area, but it cannot be denied that the small well-farmed area pays much better, in proportion, than the larger one yielding only a very medium crop, for in the latter case the savings in cultivation costs are probably balanced by the extra cost of harvesting light and weedy cane, together with the loss of humus to the cane caused by the certainty of having to burn such crops.

Regarding the probable loss by such burning, an interesting investigation into the yield and analyses of cane tops and trash was carried out at the Colonial Sugar Refining Company's Broadwater Mill, Richmond River, New South Wales, I understand, in 1923, and the results indicated that the trash and tops from a good crop (plant) of Badila may contain several times as much humus and probably as much nitrogen as a good crop of cowpea or bean.

Considering how many years the majority of the local lands have been growing cane it will be seen how important it is to plough all tops and trash in, whenever possible.

Throughout the areas visited, a fair amount of planting had been carried out (but not as large an area as is general at this period) with a very fair strike—several very nice blocks of young Badila and Q. 813 being noticed. Large areas were, however, being got in readiness for later planting.

In reference to late and early planting, the following information taken from the Director's last year's annual report may be interesting to those growers who may not have seen same. Five each of early and late canes were tried out. The land was ploughed and planted with cowpea in December, 1923, the latter ploughed under in March following, ploughed again in May, ploughed and subsoiled to a depth of

19 in. at the end of June, whilst the final ploughing was given early in August, and the planting on the 11th of that month. In October the canes were all fertilised with the following mixture:—

Sulphate of ammonia	100 lb. per acre.
Nitrate of soda	100 lb. per acre.
Sulphate of potash	75 lb. per acre.
Meatworks	300 lb. per acre.

followed by a top dressing of 50 lb. of nitrate of soda and 50 lb. of sulphate of ammonia per acre during December.

EARLY MATURING VARIETIES.—SEPTEMBER.

Cane.	Age Months.	Tons Per Acre.	Per cent. of C.C.S. in Cane.	Yield of Commercial Cane Sugar per acre in English Tons.
D. 109	13	45·1	12·92	5·82
H.Q. 285	13	32·6	15·48	5·04
H.Q. 426	13	46·5	16·33	7·59
E.K. 28	13	47·7	17·02	8·12
Q. 813	13	48·4	16·58	8·02
LATE MATURING VARIETIES—NOVEMBER.				
N.G. 24 Goru	$14\frac{1}{2}$	42·2	14·28	6·02
M. 1900	$14\frac{1}{2}$	41·9	16·60	6·95
7 R 428 (Pompey)	$14\frac{1}{2}$	47·3	14·84	7·01
N.G. 15 (Badila)	$14\frac{1}{2}$	41·8	16·99	7·10
Cheribon	$14\frac{1}{2}$	49·3	14·33	7·06

Thus the early canes gave an average tonnage per acre of 44 tons, with an average yield of sugar per acre of 6.91 tons, against the late canes' average of 44.5 tons per acre and an average sugar yield of 6.82 tons.

Cane Varieties.—A large number of varieties are grown in the Mackay area, of which the principal varieties are M. 1900, Q. 813, Malagache, D. 1135, Black Innis, H.Q. 426, N.G. 15 (Badila), Cheribon, 7 R 428 (Pompey), E.K. 28, H.Q. 285, and several others in lesser quantities. Q. 813 and M. 1900 still continue to give great satisfaction as regards density, the latter unfortunately suffered from Red Rot last year to a certain extent. 7 R 428 (Pompey) was looking very well in various parts of the district, and seems to be a cane capable of giving good tonnage and density, in poor to medium ground, if cut at the right time of the year. A plot of first ratoons of this cane cut between 17th and 30th of November gave a tonnage of 40 tons per acre and an average c.c.s. of 16. The ratoons now look good enough for a 30-ton crop if cut late.

Some splendidly vigorous looking E.K. 28 was also noticed growing upon the station, having only been planted in September. In several parts of the district good plots of this cane were growing, an especially good stand being noticed upon the farm of Mr. P. C. Brooks, near Sarina. In speaking of this gentleman it might be mentioned that he is trying out an experiment in using some 70-80 tons of molasses per acre upon a paddock, corn was subsequently ploughed in, and the land will be planted in or near August next. At this farm experiments in cassava are being carried out; some sixteen or seventeen different varieties were noticed. Probably some 100 growers have an average of 1 acre each of this crop.

Cane Diseases.—Mosaic is certainly the most common disease in the district, but the writer did not see as much as he had expected to. It was noticed in H.Q. 426 ratoon, D. 1135 ratoon, Shahjahanpur No. 10 ratoon, Badila plant, Malagache plant, H.Q. 426 plant, and Q. 813 plant. Leaf stripe or "Downey Mildew" was noticed in B. 147 plant and E.K. 1 ratoons. Red Rot was noticed in H.Q. 426, M. 1900, and Innis. Gum was noticed in one case in H.Q. 285 ratoons.

Wire Worms.—Damage from same had not been very serious up to then, in fact, only a very few growers had experienced loss from same.

Grubs were bad in a block of second ratoon D. 1135 and old ratoon Uba, both in the Farleigh area.

Moth and Beetle Borers had also caused very minor damage in odd places.

"BUNCHY TOP" IN BANANAS.

FINAL REPORT OF INVESTIGATION COMMITTEE.

Far-reaching recommendations, including proposals for joint legislative action by the Governments of Queensland and New South Wales, to ensure the policing of the banana-growing areas affected by bunchy top, the destruction of affected banana plants, the registration of all banana, plantain, and Manila hemp plantations, and the destruction of all backyard or garden banana plants in unregistered places; restrictions on the transport and sale of banana suckers and the imposition of various other responsibilities on the Governments and the growers for the control and eradication of bunchy top, are contained in the final report of the committee of investigators into the occurrence of this plant disease in Australia.

"It has been definitely proved that bunchy top is a disease transmitted from diseased to healthy plants by the banana aphis."

"Measures serving for the exclusion of the bunchy top disease in bananas from unaffected areas or from plantations in lightly affected areas, and measures for the eradication of the disease from heavily and lightly affected areas, represented the only means available for controlling bunchy top."

These are the final conclusions of the committee consisting of Professor E. J. Goddard (Supervisor), C. J. P. Magee (Assistant Plant Pathologist), and H. Collard (Horticulturist). Their report is made to the Bunchy Top Board of Control by which they were appointed, and which now consists of the following members:—Professors E. J. Goddard, B.A., D.Sc. (University of Queensland), R. D. Watt, M.A., B.Sc. (Sydney University), and F. G. B. Osborn, D.Sc. (Adelaide University), Messrs. E. Graham (Under Secretary for Agriculture, Queensland), G. D. Ross (Under Secretary and Director of Agriculture, New South Wales), and G. Lightfoot (Acting Director of the Commonwealth Institute of Science and Industry).

Conclusions.

Consequent on the foregoing decisions, the investigators have concluded:—

"That no protectionary measures are available.

"That no resistant or immune banana stock is available.

And "that no remedial measures are available."

But they make comprehensive recommendations, the efficient discharge of which by all concerned, together with the continuous full co-operation of the growers and of the various societies and associations and other bodies interested in banana-growing, will, they consider, result in the restoration of the industry in heavily affected areas to its former status.

Recommendations.

These recommendations are as follows:—

(1) Until such time as it can be declared that any particular district is free from bunchy top, the shifting of suckers in any part of Queensland should be prohibited; after receiving a clean certificate the embargo could be lifted in any district, which would then be protected by the observation of the other recommendations made.

(2) Prohibition of the transportation of any vegetable portions of any banana plant (or any member of the genus Musa) from any part of the areas affected with bunchy top to any area not affected with the disease or to any lightly affected area.

(3) Prohibition of the shifting of suckers of banana plants (or any species of the genus Musa) from any plantation within a lightly or heavily affected area to any other plantation within that area.

(4) No person should be allowed to trade in suckers or to transport suckers from any plantation in New South Wales or Queensland to any other plantation in either State, unless, after receipt of a statutory declaration from the person concerned to the effect that bunchy top has never been detected in the plantation from which suckers are to be obtained, a special permit has been granted by a competent official; and, further, no such permit should be granted unless the plantation from which suckers are required, as well as those plantations immediately surrounding it, has been examined by the official not more than fourteen days previously, and it has been proved that bunchy top is absent, and has never been present in any, or all, the plantations.

(5) The immediate destruction of all banana plants (or any member of the genus Musa), in backyard or similar gardens, that is, in other than registered banana plantations, and the prohibition of the growing of these plants in such gardens.

(6) Registration of all plantations in which any species of the genus Musa (banana, plantain, Manila hemp), is cultivated, throughout Queensland and New South Wales.

(7) Immediate destruction in any plantation of every stool in which any portion or plant has shown symptoms of the disease in any lightly affected area; in such cases where the disease becomes very strongly developed, or in lightly affected plantations in specially located areas, which call for special consideration, all plants to be destroyed.

(8) A systematic examination by the grower, at regular intervals, of all stools in a plantation in any lightly affected area or unaffected area.

(9) Bunchy top should be made a notifiable disease in any area not so far known to be affected with the disease, or in any plantation which has been apparently free from the disease as late as the legislative enactment of these recommendations.

(10) Prohibition of the transport of banana fruit from any affected area to the unaffected area north of the affected area, or out of any affected zone in which the disease appears at any time, to any unaffected zone.

(11) Illustrated lectures and practical demonstrations of an educational nature throughout the banana-growing areas with a view to enabling growers to identify the disease at the earliest possible stage; and distribution of a clear, concise, and fully illustrated pamphlet indicating the symptoms of the disease, the manner in which it is distributed, and the combative methods recommended.

(12) A systematic inspection of banana plantations throughout Queensland and New South Wales should be undertaken for the purpose of gathering all available information in respect of the condition and history of the plants; and immediate attention should be given to the plantations situated beyond the affected areas, but which have received suckers within the past few weeks from areas now known to be affected.

(13) All deserted plantations in existence should be eradicated within a definite period after the legislative enactment of these recommendations.

(14) All affected plantations should be cleaned up within a definite period after the legislative enactment of these recommendations.

(15) Owners should be liable for harbouring affected plants after the expiration of that period.

(16) After a further definite period from the legislative enactment of these recommendations, consideration should be given to the matter of the complete destruction of all banana plants throughout the affected areas, or in certain plantations bearing unfavourable reports within those areas, and the prohibition of planting-up for an indefinite period in such areas or plantations.

(17) Growers should be dissuaded from planting-up within the known heavily affected areas until such time as an official statement intimates that such procedure offers reasonable chances of success, or until such time as the cleaning-up of the affected area has been completed.

(18) Immediate destruction of all affected stools in any plantation in any area from which bunchy top has not been reported prior to the legislative enactment of these recommendations; in such cases where the disease becomes very strongly developed, or in lightly affected plantations in specially located areas, which call for special consideration, all plants to be destroyed.

(19) It should be made compulsory on the part of the owners to complete the destruction of all banana plants on land which has passed out of systematic cultivation, and so prevent the persistence of deserted plantations.

(20) A Government nursery should be set up in some part of Queensland that is free from bunchy top and beetle borer, for the supply of reliably healthy suckers at a reasonable price.

Legislation Suggested.

(21) A most serious effort should be made by the Governments and growers concerned, in the different discharge of these recommendations, with a view to hastening the eradication of the disease, and thereby restoring the industry to its

former status as quickly as possible, and preventing the spread of the disease. With this object, the following suggestions are submitted for consideration:—

(*a*) Where the necessary powers are not available under present enactments, the Governments concerned should legislate as quickly as possible, and it is desirable that such legislation should, as far as practicable, be on the same basis in Queensland and New South Wales.

(*b*) The necessary machinery should be devised by the Governments of New South Wales and Queensland for giving effect to the regulations, controlling the problem of eradication, and intensifying the educational aspects.

(*c*) Provision should be made for an adequate staff of competent inspectors who should be provided with motor transport facilities.

(*d*) As the further investigation of certain aspects of the bunchy top problem is contemplated, the results of which will be submitted to the Bunchy Top Control Board, from time to time, in reports from the supervisor, it is desirable that there should be the fullest co-operation between that body and the State Departments concerned.

(*e*) A definite effort should be made to enlist the co-operation of the various societies or associations interested in banana-growing.

(*f*) Consideration should be given by the Governments concerned to the means of dealing with the difficult problem of heavily affected or deserted plantations, such as making provision for funds for eradication by means of a monetary advance against the land, to be redeemed within a certain number of years, or by means of a levy on the industry—on an acreage or production basis—assisted or unassisted by a Government contribution.

Distribution of the Disease.

The report refers in detail to the huge losses which the disease has inflicted in New South Wales and Queensland.

The investigations carried out had not shown any plant, other than a member of the genus Musa, as a positive host of the bunchy top disease. All varieties of the banana grown in Australia were susceptible to bunchy top. The chief and only commercial variety of banana grown in North-Eastern New South Wales and Southern Queensland was the cavendish (Musa cavendishii). This dwarf variety was very susceptible to bunchy top, but appeared to be the only variety which could be grown profitably in these districts on account of climate and windy situations of plantations.

Bunchy top has been transmitted to healthy Manila hemp plants under glass-house conditions at Tweed Heads. Attention is directed to the danger presented by any possible transmission of the disease to the indigenous species of the banana which grow in the dense scrubs of the North.

Bunchy top had a comparatively wide distribution among banana-growing countries. In Australia the disease was well developed in North-Eastern New South Wales and South-Eastern Queensland, and was present also in isolated centres of the banana areas of North Queensland. As infested suckers were sent from Queensland during 1925 to the North Gascoyne district of Western Australia, there was little doubt that the disease was also present there.

Transmission by Aphides.

Turning to the transmission of the disease by an ultra-microscopic agent—the banana aphis (*Pentalonia nigronervosa*)—the report said that its spread in Australia was due primarily to the propagation of infected suckers over wide areas, and then to natural transmission by aphides. There was evidence available that the soil, apart from its harbouring of infective aphides for a limited period, did not become infected. As attempts to transmit the disease by direct sap-inoculation had so far met with failure, it would appear that the disease could not be spread by infected implements during cultural and harvesting operations, such as the pruning of suckers and the cutting of bunches.

Aspects of the Problem.

The investigators pointed out that, in considering the matter of control, they have kept in view two distinct aspects of the bunchy top problem:—(1) That concerned with the conservation, as far as practicable, of the industry in the affected area, and the problem of bringing the industry in the same area back to its original status, as well as the resuscitation of the industry in those portions

of the area where it had become moribund; and (2) the protection of the large area in Queensland which was in no way affected with the disease.

The exclusion of the disease from any area could be effected, provided that none but healthy suckers were imported into that area, and that the area was sufficiently remote from any affected plantations to remove the possibility of migration or transportation of infected aphides.

No reliance could be placed on any apparently healthy plants taken from plantations in which bunchy top had ever appeared, as it so often happened that the disease might possibly be latent, or might not have developed to the symptomatic stage at the time when the plants were under observation. The only areas which could possibly be regarded as free from bunchy top in Queensland were those lying south of the Innisfail district and north of the latitude of Yandina. The disease was now known as a very light infection in two plantations in the Innisfail district, one plantation at Yandina, in a plantation at Beerwah, and several other plantations not so far north of the Caboolture River. As suckers had been sent out from an infected area to all parts of Queensland as far north as Innisfail, even at a recent date, suspicion of a wider area of infection must be considered.

Transport of Suckers.

A proclamation forbidding uncertified transport of suckers had been adopted by the Queensland Government, and it was necessary on the growers' part to secure suckers from such areas in Queensland as could be definitely pronounced free from bunchy top by the authorities of the State.

The regulation preventing the exportation of suckers from the affected area to northern areas must not only be most rigorously discharged if the northern area was to be kept free from the disease, but every effort should be made to have all possible links between the two areas eradicated.

A prohibition of the sale of suckers in any area except under the restrictions mentioned should be effected in order to exclude the disease from healthy plantations in any lightly affected area and to assist in overcoming any appearance of the disease due to the accidental transportation of diseased suckers into a healthy area.

The discovery of the disease in a garden at Auchenflower, a northern suburb of Brisbane, suggested very clearly that a definite method of procedure was imperative in dealing with the casual cultivator of banana plants. The disease by such household backyard cultivation might be spread throughout the Greater Brisbane area, which was a connecting link between the areas to the north and south of it.

Thus all banana plants or any member of the genus Musa, in all backyard gardens in Queensland, should be destroyed at once and the growing of such prohibited.

Frequent Inspection Necessary.

In carrying out the recommended periodical—preferably weekly—examination of each plant in each stool, the growers should pay careful attention to the last leaf in each plant and observing whether there was any trace of the characteristic broken dark green streaks in the leaf-blade, as described in the recently issued bulletin.

The investigators condemned the practice of leasing land for banana-growing to illiterate aliens.

Special attention was given to the possibilities offered by the use of sprays, dusts, and various specifics, but the results did not indicate that spraying was an effective method of control.

Thorough Eradication the Real Solution.

The thorough eradication of all stools affected with bunchy top appeared to be the real solution of the problem. In view of the manner in which the infected plantations were distributed, they considered that the Government of Queensland should endeavour to fight the disease by ensuring the extermination of the disease in the Innisfail district, instead of devoting merely general attention to all the affected areas. They recommended that the Queensland Government should undertake the responsibility of destroying all the plants in any infected plantations in the Innisfail area. As the infected plantations were very young, the growers should suffer no serious loss, and the financial obligations of the Government should not be very great. This would probably ensure the future existence of the banana industry in the North. As only isolated plantations, as at Yandina and Beerwah, and in certain areas to the South, had recorded the disease, it would be good procedure to

destroy all plants in any affected plantations at Yandina and Beerwah. Elsewhere, in areas where the disease occurred with greater frequency, the question of financial aid would, perhaps, be too serious, and, provided the regulations were discharged, there would seem to be no great merit in enforcing the destruction of all apparently healthy plants in an affected plantation.

Regarding remedial measures, the report held that reputed remedies were valueless.

Further Investigations.

Comprehensive researches would continue to be carried on at the Queensland University under the present supervisor.

The appendixes, among other matters, deal fully with the various operations at the experimental plots, with Mr. Collard's visit to Fiji, and to experiments with Fijian plants, and with poisons.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING APRIL, 1926 AND 1925, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1926.	April, 1925.
North Coast.	In.		In.	In.
Atherton	4·39	25	2·17	5·07
Cairns	12·15	44	8·71	9·57
Cardwell	9·66	52	3·90	4·13
Cooktown	9·09	50	6·50	6·64
Herberton	4·21	39	1·34	3·82
Ingham	8 65	34	1·82	2·96
Innisfail	21·39	45	13·76	20·69
Mossman	10·42	13	3·96	11·74
Townsville	3·74	55	0·03	0·04
Central Coast.				
Ayr	2·79	39	...	...
Bowen	2·88	55	...	0·40
Charters Towers ...	1·72	44	...	...
Mackay	6·67	55	0·90	1·79
Proserpine	6·45	23	1·10	3·01
St. Lawrence ...	2·79	55	0·26	0·68
South Coast.				
Biggenden	1·80	27	1·59	0·35
Bundaberg	2·87	43	0·76	0·56
Brisbane	3·56	75	2·36	0·98
Childers	2·51	31	2·32	0·66
Crohamhurst ...	5·70	30	6·17	2·42
Esk	2·55	39	3·65	0·77
Gayndah	1·31	55	0·30	...
Gympie	3·13	56	2·65	1·21
Caboolture	3·90	39	4·26	0·94
Kilkivan	2 03	47	0·52	0·04
Maryborough ...	3·40	54	4·68	1·72
South Coast—continued:	In.		In.	In.
Nambour	5·38	30	5·57	4·07
Nanango	1·76	44	1·56	0·23
Rockhampton ...	2·27	39	0·80	0·19
Woodford	4·10	39	3·47	2·05
Darling Downs.				
Dalby	1·20	56	1·38	0·04
Emu Vale... ...	1·15	30	1·14	0·08
Jimbour	1 20	38	0·91	...
Miles	1·30	41	0·53	...
Stanthorpe ...	1·64	53	0·56	0·29
Toowoomba ...	2·38	54	1·39	0·31
Warwick	1·60	61	0 34	...
Maranoa.				
Roma	1·23	52	0·17	...
State Farms, &c.				
Bungeworgorai ...	0·78	12	0·21	...
Gatton College ...	1·53	27	1·28	0·10
Gindie	1·14	27	...	...
Hermitage ...	1·18	20	0·59	...
Kairi	4·93	12	3·30	5 34
Sugar Experiment Station, Mackay	5·16	29	1·12	1·69
Warren	1·31	12	0·75	...

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for April this year, and for the same period of 1925, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

ABSTRACTS AND REVIEWS.

All foreign agricultural intelligence in this section, unless otherwise stated, is taken from "The International Review of the Science and Practice of Agriculture" and "The International Review of Agricultural Economics," published at Rome by the International Institute of Agriculture.

Hail Insurance.

"La Bulgarie," Third Year, No. 735, Sofia, 16th December, 1925.

Hail insurance was introduced in Bulgaria by the law of 26th December, 1911, and is based on voluntary co-operation. In 1912, the first year in which the law was applied, more than 17,000 farmers insured their crops against hail. In 1915 the number had doubled, and in 1917 it reached more than 38,000. After this date, however, hail insurance entered upon a period of unexpected decline, the reasons of which are by no means clear. In 1922 the number of farmers who had insured their crops against hail fell as low as 7,713. But from this date the number began to increase, and in 1925, after changes in the managing staff of the Central Co-operative Bank of Bulgaria, which undertakes this class of insurance, it reached 25,400.

The following table gives precise information regarding the development of hail insurance in Bulgaria:—

Years.	Number of Policy Holders.	Total Sums Assured.	Premiums.	Compensation Paid for Damage Caused by Hail.
		Leva.	Leva.	Leva.
1912	17,548	28,255,390	630,799	1,037,726
1913	25,026	39,326,400	921,182	869,761
1915	35,552	41,742,945	1,326,357	1,227,235
1917	38,765	65,537,950	2,114,135	934,684
1918	34,304	86,450,740	2,862,874	2,349,077
1919	31,064	123,316,620	4,805,292	4,155,393
1920	12,273	60,824,470	3,082,258	3,965,251
1921	9,467	74,622,260	3,459,879	2,974,103
1922	7,713	141,546,120	5,048,284	6,029,895
1923	8,739	155,398,920	5,781,805	6,101,283
1924	13,548	186,557,150	9,134,441	4,900,931
1925	24,500	386,199,560	14,425,954	9,000,000

(A leva is worth about 9½d.—Ed.)

The new law on agricultural insurance, passed by the Chamber in 1925, which made considerable improvements in the system by granting effective State-aid to the societies for the mutual insurance of crops, has greatly contributed to the striking increase in this class of insurance in 1925. This new law provides for the organisation of insurance not only against hail, but also against frost, drought, and floods.

Compulsory Hail Insurance.

Assicurazione obbligatoria contro i danni della grandine. Bill brought in and communicated to the Presidential Bureau, 15th November, 1925. Chamber of Deputies, Session 1924-25. Parliamentary Proceedings, Italy, No. 616.

The development of hail insurance in Italy has not been in proportion to the area under cultivation nor to the variety in the crops, the frequency of the phenomenon and the serious nature of the resulting damage (1). At the present time the limited number of insured persons tends to keep up the premiums and the high rates charged in their turn act as a deterrent, and the current view is that for certain crops and in many regions there is no advantage in taking out hail insurance. As a way out of this deadlock, Signor A. Marescalchi, who had already on several occasions in recent years called the attention of the Government to this important problem, introduced into Parliament on 15th November, 1925, a legislative proposal, with which other deputies were also associated, for "compulsory insurance against

damage by hail (assicurazione obbligatoria contro i danni della grandine).'' The extension of this scheme to the whole of Italy with its varied configuration, its great variety of soil characteristics and of crops, and the obligatory adherence of all agriculturists is the best way, as Signor Marescalchi remarks in the report which accompanies the proposal, to surmount the main difficulty, which is that of keeping the rates of insurance low so as to bring the advantages within the reach of all, while arranging a convenient scale of premiums according to the prevalence of hail storms and the crops of the different regions.

By the terms of the Bill all agricultural products must be insured, with the exception of those for which this precaution is not usually necessary; the undergrowth of forests, and pasture and meadow growths, &c. The insurance must be made by the owner of the land, or by the holder in emphyteusis or usufruct or by the tenant, and in each case at such person's expense. When, however, the land is held on a produce sharing tenancy, in which the produce is equally divided between the landowner and the tenant or on any other form of share tenancy, the owner, holder in emphyteusis or usufruct, or tenant has the right to claim from the share tenant so much of the premium as is proportionate to the share of the farm produce which falls to his lot.

The insurance may be made by private societies or companies which are already engaged in this branch of insurance, or by any societies that may have been empowered to do so in accordance with the terms of the law of 17th April, 1925, No. 473, and with the special regulations which will be issued. Authorisation may also be given for the formation of local insurance funds as between the farms of certain districts, on the understanding that such farms represent at least 300,000 hectares of cultivated land. The object of fixing this minimum area of insurance is to prevent the formation of small insurance societies, with no solid basis, which, owing to the insufficiency of their funds, can only be a source of disappointment to farmers.

It will be seen that State monopoly is excluded. The State is merely called upon to supervise and control the methods employed, and institutions which have the required qualifications of sound organisation are free to undertake the insurance. The proposer of the measure is of opinion that in this way the payment of the premium will be a less heavy burden on the farmers and he would also allow societies, both national and local, to federate and make use of reinsurance.

Under the Bill fines from 500 to 10,000 liras are imposed for non-observance of conditions. (1) According to a recent publication of the Ministry of National Economy (''Gli istituti e le imprese di assicurazioni private in Italia nell'anno 1923'') hail insurance is provided in Italy by thirty-three Italian companies, twenty-six both for insurance and reinsurance and seven for reinsurance only, and also by two foreign companies which arrange both insurance and reinsurance.

DESTRUCTION OF THE KHAKI WEED.

By C. T. WHITE, Government Botanist.

Many persons are much alarmed at the spread of this pest on the Downs and some other parts of Queensland.

The Khaki Weed (*Alternanthera achyrantha*) is a native of South America, and was introduced into South Africa in fodder from the Argentine during the time of the Boer War, and from South Africa it is thought to have made its way to Australia. Since its introduction to Australia it has steadily increased until it has become one of the worst weed pests. In 1918 an officer of the Department of Agriculture and Stock, Mr. F. B. Smith, B.Sc., Assistant Agricultural Chemist, visited Beaudesert to inquire into the destruction of Khaki Weed by chemical means, and reported that the weed was easily destroyed by common salt (butcher's salt or any coarse, common waste salt) at the rate of 1-2 tons per acre. A weak arsenical solution containing 0.2 per cent. arsenic will also be found effective where the poisonous spray could be used.

The value of salt as a weed destroyer lies in its property of absorbing moisture both from the soil and plant tissues, and so kills the plant by thirst; thus to prove effective it should be applied in hot, dry weather.

In small areas Khaki Weed is best destroyed by hand grubbing or chipping, but as it has the power of sending out roots from the joints there is always the chance, unless the work is carried out in hot, dry weather, of the cut pieces growing again, so that the cut up plants should be all raked up and burnt.

FORAGE POISONING.

FACTS DISCLOSED BY VETERINARY RESEARCH.*

In veterinary literature the term "forage poisoning" is now restricted to a peculiar kind of fodder and forage poisoning, and may be defined as a disease caused by eating foodstuffs which have become poisonous (toxic) through the growth in the fodder of a particular microbe, *Bacillus botulinus*. Horses are most commonly attacked, since it is that animal that is most commonly fed on prepared fodder, though cases in cattle are by no means uncommon, and even sheep and pigs may be affected at times.

It is important to realise that it is not infectious or contagious, and therefore that one animal does not contract it from another. It is only the animals which actually partake of the poison (poisoned foodstuff) that are affected.

One may say that any kind of fodder may at times be possessed of this poisonous property; thus the disease has been found to occur both in pasture-fed and in stabled animals, *i.e.*, it may be contracted from grass pasture or from eating hay, chaff, grain, corn, or silage. It is found, however, that certain of these fodders are more liable than others to be dangerous, and to realise why this should be so we must briefly review what we know of the causal microbe, where it is found, how it may get into fodder and how it grows and produces its poison therein.

Where the Microbe is Found.

This microbe is what is known as a saprophyte; that is, it may be found in soil, dust, or water, and ordinarily lives therein, gaining its nutriment from dead (decomposing) vegetable material. It is not capable of directly attacking either plants or animals in the living state. We have no exact knowledge as yet as to how common it is in the soils of the State, but such examinations have been made in other countries (and are being made here), and from these we have reason to believe that it is far from uncommon. This is supported by the fact that cases of the disease have been met with in the past three years in the Young, Warren, Coonamble, Gundagai, Murwillumbah, Inverell, Riverina, and Narrabri districts. It would appear, therefore, to be somewhat widely distributed. If this is so it may be asked, why is the disease not more common? The answer is that the mere presence of the microbe itself is not sufficient; the conditions for its multiplication must also be present, and, as will be seen, such are quite special and not always available.

Being in the soil, the microbe easily gains access to such fodders as hay, chaff, and silage through the dust raised from the surface soil. It then requires suitable conditions of moisture and warmth in order to multiply, being in this manner like a seed, which, as is well known, will not germinate and thrive unless conditions are adequate. This microbe is, of course, microscopic, and even when multiplying in fodder does not produce any recognisable changes; it of itself does not make the fodder appear in any way unwholesome. Conditions which favour its growth, however, also favour the growth of other micro-organisms, particularly moulds, and thus we frequently find it growing in mouldy fodder. This, however, is not entirely a chance arrangement, for whereas ordinarily this bacillus can grow only in the absence of air, it can grow in fodder exposed to air if it has a growth of mould overlying it. Thus mouldy fodders are more liable to contain this microbe and be dangerous.

This association of the disease with the use of mouldy fodder was responsible for the idea held at one time that the disease was due to mouldy fodder. This is not so. Fodder which is simply mouldy can and does produce digestive substances, but it does not induce the disease we call fodder poisoning unless this particular microbe has been growing in and produced its characteristic poison in such fodder.

Humid Conditions Favour Development.

The degree of warmth necessary is furnished through the greater part of the year in a climate like that of New South Wales, where, even in winter, one finds the days sufficiently warm to allow of mould and bacterial growth. In the summer, however, such is much more liable to occur, and we find therefore that the disease is met with chiefly in summer and autumn, particularly if the latter be mild.

The moisture requirement may be supplied by moisture in the fodder, but in such fodders as hay, grain, or chaff, which are normally somewhat dry, exposure to a shower of rain is especially favouring, and therefore it follows that rain during harvesting or rain on an open stack is liable not only to damage the fodder by inducing mould growth, but also to provide adequate conditions for the growth of the casual microbe of forage poisoning.

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* From the "Agricultural Gazette" of New South Wales for March.

Thus it has come to be recognised that the disease is especially liable to be met with in seasons in which, during late spring, summer, or autumn, fodders have been exposed to heavy rains after a warm spell, and again followed by bright sunshine —in other words, humid conditions.

Need for Care with Silage.

Silage is especially liable to be attacked, owing to two factors—(1) its high moisture content, and (2) its liability to become mouldy. As is well known, a well-prepared pit or silo shows no mould through the greater part of the stack, but only on the surface, and it is just this mouldy surface layer which is liable to be dangerous. If silage be exposed, however, particularly if a pit be opened and exposed to the weather, the exposed part, previously sound, becomes mouldy, and if it has been contaminated by soil containing this microbe it is liable to contain the poison, and to be dangerous.

Wholesome silage is not likely to be harmful; damaged, mouldy silage may be dangerous, and should not be fed.

Infection in Grass Pasture.

It may be wondered, seeing this is a disease associated with damage to dead plant material, how grass pasture can be dangerous. A moment's reflection, however, will serve to recall that whereas shortly-cropped grass would not be likely to be dangerous, tussocky grass, particularly the rank growths found near creek beds or on inundated land, may easily contain much dead material, both leaf and stalk, and such clumps may be somewhat damaged and mouldy about the butt.

In harvest fields, again, where winnowing is carried out in the paddock, the site of the winnowing operations is marked by the presence of a heap of vegetable material, usually containing more or less grain. Where rain has fallen on this we find it matted down and decomposed to a greater or lesser extent. The sprouted grain is readily sought by any animals which may be grazing in the paddock, and as they nose about in search of it, or, even in search of whole grain, such animals are likely to gather some of this decomposing harvest refuse. Such material offers most suitable conditions for the multiplication of the poison-producing microbe, and there are several cases on record of the disease having been contracted under these conditions.

Two Important Facts.

There are two other facts concerning this poison that must be borne in mind, namely, that among poisons it is ranked as one of the most powerful, and that it is soluble in water. Regarding the first, it may be stated that the poison has never yet been isolated free from extraneous matter. When produced in the laboratory by cultivation of the microbe in broth and subsequent filtration of the broth to remove all solid matter and the microbes themselves, we find such a fluid may be so poisonous that two drops may be sufficient to kill a horse. If the water were removed from such a quantity by evaporation we should have little more than a speck of dust, highly poisonous, but even then not the poison in the pure state.

Being soluble in water, it follows that the poison is easily washed from that part of the stack where it was produced to some other part, and thus we may find that fodder which appears quite sound itself, may, by having been overlaid with damaged fodder and subjected to rain, have had sufficient of the poison washed into it to cause the disease. A further point is that as the poison is so powerful, sufficient may be produced in small "pockets" of mould in the fodder, such pockets being so small and infrequent as to be easily overlooked.

It has further been recognised in some places that the disease may be contracted by animals drinking water that has percolated through decomposed and mouldy vegetation.

Moreover, it has been found in Australia that this disease occurs especially in those seasons when there are mouse plagues, when, of course, there are not only many living but also many dead mice in the stacks, and especially in the chaff therefrom. Such stacks have always a musty odour, and close examination will show that there, especially in the nests, are just the conditions suitable for the multiplication of this microbe, namely, moisture provided by the urine, and warmth from the bodies of the mice. The presence of dead mice, moreover, provides a most suitable breeding-ground for the growth of moulds and other micro-organisms associated with decomposition, a state of affairs which favours the multiplication of this poison-producing microbe—if it be present.

CASSAVA AS A STOCK FOOD.

By G. B. BROOKS, Instructor in Agriculture.

Recently a number of cassava varieties were introduced into Queensland from Java and planted in the Sarina district, the objective being to utilize the tubers or roots for the manufacture of power alcohol. As a result of the publicity given to the production of power alcohol from cassava, quite a large number of applications for cuttings have been received by the Department of Agriculture from farmers for propagation purposes. Owing to the desirability of growing the imported material under close supervision and restricting operations to one district, those requests, unfortunately, could not be complied with. As cuttings from subsequent crops will in all probability be distributed over most of the coastal area, it is essential that intending growers should have some knowledge of the respective varieties raised, otherwise serious results may eventuate when feeding the roots to stock or using as a vegetable.

It may be mentioned that the main objective in the introduction of new high starch-yielding varieties into the State was for the manufacture of power alcohol, consequently the sorts likely to give the best results in this direction were secured, the fact of their being poisonous or otherwise being a secondary consideration.

In Java, cassava is raised extensively as a plantation crop, a factory treating from 400 to 500 tons of tubers per day in the manufacture of flour and tapioca. On the large estates, where as many as 15,000 natives are employed, the extremely poisonous varieties are generally preferred as a safeguard against the stealing of the roots.

Apparently only two varieties were grown in Queensland prior to the recent introductions—*Manihot Utilissima* and *Manihot Aipi*, commonly known as "bitter" and "sweet." It has been found that at least one of these contain poison, cases having occurred where pigs have been affected through being fed on tubers. Quite recently a farmer who has used cassava extensively for pig-feeding purposes reported that his animals got sick occasionally through being fed on raw tubers, but so far none had died. Boiling the roots and discarding the water renders them harmless. Slicing and exposing to the sun for a time is also said to dissipate the poison. The former precaution is recommended.

Although definite information could not be obtained as to the poisonous nature or otherwise of the recently introduced varieties, the following particulars were kindly supplied by Dr. L. Koch, chief of the Plant Breeding Establishment, Buitenzorg, and apply to seven Brazilian sorts procured from that institution.

Mangi and Valenca—Free from prussic acid; can be eaten raw.

Itaparica, Tapicuru, and Basiorao—Somewhat poisonous if fed in large quantities; usually considered non-poisonous.

Sao Pedro Preto—Extremely poisonous.

Creolinha—Also poisonous; unsuitable for feeding purposes.

The leaves of all varieties contain prussic acid, but in such a low percentage that they are used regularly as a cattle food. On one estate 1,200 draught oxen are fed largely on leaves of Red Singapore. It may be mentioned that a consignment of Red Singapore is expected to arrive from Java during the latter end of April.

It being impossible to secure sufficient cuttings of selected varieties in Java, some 70 per cent. of the cassava planted in the Sarina district is necessarily composed of mixed commercial types. This material will be classified, and each variety planted out separately, in order to ascertain yields, starch contents, poisonous properties, &c. Until this is effected the farmers who are growing such should exercise caution in regard to the use of the tubers as a vegetable, or for stock-feeding purposes. Some farmers are, I believe, already using the tubers for table and find them equal to sweet potato.

In South America, and in Java, cassava is one of the principal food crops. In the latter island the annual area under crop is given at 1,674,856 acres. It is estimated that 90 per cent. of the crop is grown and made use of by the natives, either boiled similar to the potato, or ground into flour, and made into cakes, puddings, &c.

Cassava is likely to become popular with farmers as a pig food on account of its hardiness. Most of the consignments secured in Java were planted at Sarina approximately two months after harvesting, and although the soil was extremely dry when the cuttings were put in, a good germination was in most instances obtained. When rain fell, growth was extremely rapid. Its habit of growth is also in its favour, permitting it to stand over in the field for two years if need be, the tubers simply increasing in size with age.

In areas subject to heavy frosts the growing season would undoubtedly be too short to secure high yields. "Mangi" is probably the hardiest of the introduced varieties, growing satisfactorily at an altitude of 3,000 feet. It has also the reputed advantage of being non-poisonous.

It is not intended in this article to deal with the cultivation of the crop, but it may be mentioned that cuttings of mature wood, about 8 inches long, should be planted in an upright position, and only sufficiently deep to ensure growing on a bottom moisture supply. Shallow planting not only favours heavy yields, but induces surface rooting, thereby facilitating harvesting operations.

SURPLUS PRODUCTION AND MARKETING PROBLEMS.

In an address at the annual meeting of the Illinois Agricultural Association held in Champaign, Illinois, Mr. W. M. Jardine, United States Secretary of Agriculture, declared the surplus problem to be a problem underlying the whole agricultural situation. He expressed it as his belief that "something constructive could be done towards reducing the handicaps which surround certain phases of agricultural merchandising," and in alluding to the discussion for the formation of a Federal Farm Board or Commission, Mr. Jardine said that he saw "in a rightly constituted agency of this nature the possibility of attacking the surplus problem in a constructive and scientific way." Declaring that the problems must be dealt with from the farm end, Mr. Jardine added: "I have said repeatedly and I reiterate that a substantial part of the farmer's problems must be solved on the farm." He said that there are at least eight points which should be included in a programme for improvement of the fundamental agricultural situation. In citing taxation as the first, he said that he firmly believed that America's system of valuation could be materially improved and the tax burden of farmers substantially lightened by reducing present inequalities in assessments and by giving greater consideration to the earning power of land in making such assessments.

Referring to the subject of Government land policy, he said that the time had come, in his judgment, to shape public policies of land utilisation definitely to the advantage of agriculture as a whole. This meant that Government should not embark upon uneconomic development projects. It meant wise control of the grazing and dry lands of the Nation. It means that the State and Federal Government should take a hand in reforesting certain land which is clearly submarginal for cultivation. It meant adherence to a broad policy of conservation on the part of the Federal Government.

Agricultural Credit.

The organisation of agricultural credit corporations through which the intermediate credit banks can be reached was also advocated by Mr. Jardine. He declared that there must be substantial readjustments in freight rates and urged the development of co-operative marketing along sound lines. On the subject of the surplus problem he had the following to say:—

"The eighth and last point in the programme I have outlined concerns the surplus problem. Agriculture has always had to contend with wide fluctuations in prices. To some extent these fluctuations have been due to abnormal speculative influences which unduly sway the market one way or the other.

"I believe there is a proper place for the speculative factor in the making of prices, but speculation is occasionally inclined to run to unjustifiable and harmful lengths. Measures have already been taken in co-operation with the officials of some grain exchanges which should go far to eliminate undesirable speculative influences on these markets.

"But, after all, fluctuations in prices are due to economic surpluses more than to any other single cause. Surpluses have characterised our agricultural production since early times. While this is true, it is in more recent times that the surplus problem has assumed serious importance. It was not so many years ago that every farm in this land was practically a self-sufficient unit. In those days farmers measured their prosperity each year by the bountifulness of the crops. A surplus usually was a blessing.

"Then came our great transition from the handcraft to a machine age in agriculture. Specialisation and division of labour went forward with great rapidity both in agriculture and in urban industry. The old rural industries—weaving,

tanning, milling, shoe-making, and the like—were drawn out of the households and the farm communities and concentrated in cities. Inevitably, the farmer ceased to produce all his own necessities on the home farm and began instead to buy them from the factories which would produce them more efficiently and cheaply.

"So we came into an era of commercial agriculture, an era wherein the exchange of commodities assumed as vital a part in the farmer's welfare as production itself. No longer is it the size of the crop that counts but its purchasing power. The surplus frequently is not a blessing to the farmer, for even a small surplus tends disproportionately to lower the market value of the whole product.

"This is the surplus problem—this uncontrollable aspect of agricultural production that tends to put farmers at frequent disadvantage in the field of exchange relations. It is particularly an outgrowth of the transition to the modern commercial system. It is a problem underlying the whole agricultural situation. I believe we must recognise it on that basis.

A National Matter.

"The Nation must recognise this problem for it is a matter of national concern. I believe that public agencies should make every proper effort to co-operate in sound, workable programmes looking to the solution.

"In the first place, we should clearly recognise what the surplus is. It may be a useful and necessary carry-over from one producing season to another, part of which is involved in the process of manufacture and distribution, and part of which is the national reserve against fluctuating seasonal production. It may be over-production beyond the domestic and world demand. From a purely practical point of view, there is the possibility of developing marketing methods which will prevent the carry-over from depressing prices to unfair levels.

"In the field of production there is one important thing that Government agencies can do. They can furnish farmers with a background of economic information which will serve to guide intelligent programmes of production. The Department of Agriculture is already undertaking to collect and disseminate accurate information on production, movement, prices, and consumption of farm products.

"In the field of distribution, public agencies should—as they already do—help the surplus problem at many points. In this field, again, the Government can provide essential background information as a guide to orderly marketing.

"A comprehensive system of standards and grades for farm products should be set up. The Department of Agriculture has made considerable progress on this project. It has already secured establishment of standards and grades for a number of major crops. Its cotton standards are accepted in the world's markets. Such action reduces hazard in marketing and diminishes the margin between the farmer and the consumer.

"Warehouses and terminal storage facilities should be made adequate and stored farm products given a credit status on a par with other commodities. The Act permitting Federal licensing of warehouses illustrates what can be done. Cold storage and merchandising dependent thereon can be developed beyond present limits.

"Many developments will be possible in the credit structure. The system of intermediate credit is a case in point. The intermediate-credit machinery, one of the greatest accomplishments for agriculture, still needs extension, however, to fit the needs of various perishable crops. Some phase of our credit machinery must be evolved that will permit much broader storage of non-perishable crops.

Management and Marketing.

"There are, therefore, manifestly two general avenues of approach to the surplus problem. One is through better management of production, and the other through marketing distribution. In the latter field we have three major issues, the problem of storage of a given harvest pending consumption during the year or season, and the problem of storage for the carry-over. We have in all storage questions immediately the problem of credit. Beyond these two questions of storage and credit we have the third problem, and that is orderly control of the stream of supplies to the consumer. We can solve the first two of these issues by better provision of facilities, but we can only solve the third by collective action.

"I believe farmers, through their organisations, have a most powerful instrument to control the movement of surpluses into consumptive channels. In my judgment the activities of Government agencies in connection with the surplus problem should supplement and assist rather than control and direct the efforts of the farmers themselves and their associations. To accomplish this may call for enabling legislation."

REARING AND FEEDING OF CHICKENS.

P. RUMBALL, Poultry Instructor.

Possibly the most important feature in poultry-keeping is the successful rearing of the young stock. To be profitable in after life, stock have to be well grown and correctly fed from infancy. Many conditions are necessary to obtain this class of stock, but given good sound breeding stock and good incubation, the rearing and feeding are the next essential points.

Rearing.

If the chickens are hen-hatched, very little attention other than keeping them free from vermin, protecting them from predatory animals, and correct feeding are necessary, but when hatched by incubators artificial means of brooding have to be resorted to.

Artificial brooding of chickens is a difficult process with an inefficient plant. The aim is to supply heat or to keep chickens warm, and at the same time wean them from brooders as quickly as possible. No hard and fast rules can be laid down either for artificially-heated brooders or cold brooders. We have to govern our actions by the climatic conditions.

A good illustration of the requirements of brooding is given by the hen. She regulates the heat to the chicks under her care according to the age and weather conditions. If the chickens are young she moves about very little and sits fairly close, gradually increasing the amount of range as the chickens develop. On a cold wet day you will notice her collecting the chickens frequently and warming them up. It does not matter what type of brooder is used, young chickens should be confined to a very limited space until they learn where it is warm. The range can then gradually be increased, and the more outdoor life and healthy exercise they have the better.

Temperature.

In artificially-heated brooders temperature is a very important factor. If insufficient heat is supplied the chicks crowd together. The correct heat is the only method by which this can be prevented. Over-heating is also to be avoided on account of its weakening effect and the difficulty that will be experienced in weaning from the brooders. The general comfort of the chickens is a sure index that the temperature is fairly satisfactory, and if the droppings are well scattered under the hover in the morning, it is proof that the chickens have been fairly comfortable. When the chickens are first put into the brooder, they come from a nursery in the incubator which generally has an average temperature of 90 deg., and it is as well to start your brooding at this temperature, gradually reducing it until heat can be dispensed with in from three to four weeks.

Ventilation.

More chickens are lost annually due to the lack of ventilation than by any other cause. Brooders which are usually made to hold a 100 day-old chickens are generally too small for the same number of chickens a week old. It frequently happens also that the attendant makes no allowance for additional ventilation with the growth of the chickens, and although he has been successful in rearing them to the age of one week they then start crowding and dying. The lack of ventilation has a great weakening effect on both young and old stock. It causes the young to crowd, and renders the older birds more susceptible to disease. When chickens have crowded they present a wet appearance in the morning, to which the term of ''sweating'' is applied. Sweating is not the cause. The wetness is caused by the condensation of the moisture content of the breath which would have been carried away if proper ventilation had been provided. Chickens which have been overcrowded rarely recover from the ill effects, and it should be avoided at all costs.

In brooding under any system the following are the essential points:—

(1) Limited range, increasing with age.
(2) Sufficient heat, which should be reduced as early as possible.
(3) Ventilation, which should increase with age.
(4) Correct accommodation. What is just enough room for 100 day-old chickens rapidly becomes too little as they grow.
(5) Never attempt to brood chickens of mixed ages.

The Colony Brooder.

Where a large number of chickens are to be reared the colony brooder is the cheapest and possibly as effective as any other type. With this class of brooder several hundred chickens can be run together with little more trouble than would be required for a lot of 100 under most systems.

Five hundred chickens should, however, be the limit in any one colony brooder, but possibly 100 less would give slightly better results.

The colony brooder consists of a heater having a metal hover for the purpose of deflecting the heat. The fuel used in some cases is coke, while other makes are built for burning oil. Whatever type of colony brooder is to be used a special house is necessary. This house should measure approximately 14 ft. by 16 ft., and be at least 6 ft. high. The roof may be either a hip-roof or skillion. The building should be lined and ceiled and provided with ample light.

The house may be built with timber or iron. Iron is to be preferred, being of a more lasting nature, and at the same time it is not easily scaled by rats. The lining and ceiling should for preference be of ⅝-in. tongue and grooved pine, but for economy

PLATE 137 (Fig. 1).—COLONY BROODER.
Note enclosure of wire netting restraining to some extent the liberty of very young chickens.

sake wheat sacks sewn together and whitewatshed will serve. The floor should be concreted and the iron walls sunk into the ground to the depth of about 1 ft. This prevents rats burrowing under the floor, while the concrete floor is readily cleaned.

It is possible to make use of a less elaborate house for the operating of colony brooders, but it will readily be understood that a house not lined or ceiled will require a greater amount of heat to maintain the desired temperature, with the result of increasing the fuel consumption and attention to heaters.

Cold Brooding.

The term cold brooding is a misnomer. Under this system the heat of the body is retained by means of cloths or flannel and a restricted circulation of air. This method of brooding has been in operation for many years, but it is only recently that the practice has been adopted by commercial poultry breeders. The illustration of cold brooders will convey the nature of their construction. This cold brooder can be operated in brooder-houses or rearing-pens of simple construction. They have given excellent results in Queensland, and are extensively used by a large number of breeders.

Placing Chickens in Brooders.

When chickens are to be placed in brooders from the incubators the floor should have a light dressing of dry soil to absorb any excreta and to give the chickens a good footing. A small amount of litter in the nature of chaff or short straw will provide

exercise and tend to keep the chicks active, especially if some of the scratch grain is occasionally scattered among it. As previously stated, they should be confined somewhat until they learn where they can get warm, and after this encouraged to take as much exercise as possible by ranging either in specially erected runs or at liberty about the farm.

Cleanliness.

Cleanliness in every operation is essential; insanitary conditions not only pollute the atmosphere of the brooders but are frequently the cause of serious epidemics of disease. Where brooders and brooder-houses are thoroughly cleaned vermin cause little or no trouble. Brooder-houses should be cleaned out at least twice weekly, while a daily cleaning of the actual sleeping quarters is recommended.

Weaning.

When chickens are three to four weeks old it is generally necessary to remove them from the brooder-house to make room for younger ones. This is also necessary to protect the soil becoming contaminated by growing stock. Successful and correct brooding will materially assist these operations.

Colony-houses are possibly the most suitable for the housing of the chickens on leaving the brooder. These can be built on slides or wheels and moved about the fields or made fixtures. Under either conditions hurdles or netting-yard are necessary to confine the chickens until they become accustomed to their new quarters. After a week or ten days these hurdles can be removed, and providing the rearing-houses are not too close, little or no trouble is experienced with chickens becoming mixed. The numbers put out together, of course, varies with the accommodation at your disposal, but larger flocks than 100 are not recommended, although cases are known where 300 were put out in one lot and no ill effects experienced. As the stock develop it is possible to cull out the cockerels. This leaves more room for your valuable growing pullets, and protects them from the attentions of the cockerels.

A good size rearing-house for 100 chickens is one 10 ft. long, 8 ft. deep, 6 ft. high in front, and 5 ft. at back, with a 3-in. space between the top of the back wall and roof to provide ventilation. The front should be open and netted in with a gate provided. This enables you to lock the house at night as a protection from predatory animals. A temporary curtain of bag covering half of the front will afford sufficient protection from winds, &c. When the chickens are first placed in this house they are too early to perch. Various arrangements can be made to protect them from crowding into the corner, but the writer has had the best results by bedding them down on baled straw. The straw needs to be fairly deep and loose, with the corners of the house well blocked. The chickens appear to be content to snuggle in the straw instead of making warmth by crowding together. It is then only necessary to go around in the evening with a fork and loosen the straw up, shaking the droppings through on to the floor, which can then be readily cleaned up.

Poultry are largely creatures of habit and can generally with care be trained to act as required. When once they form a habit—good or bad—it is difficult to alter. A little time spent in seeing that chickens go into the house of a night when first placed in a new yard or when they are first let out of the brooders into the netted runs will amply repay poultry-keepers by preventing losses through crowding.

Feeding.

There is a good deal of difference of opinion on this subject. Foods and methods of feeding which answer well with certain lots of chickens, and where operations are on a small scale, are not always workable where hundreds of chickens are to be reared.

Your primary aim is good healthy growth. The speed with which a chicken grows is very rapid, and nothing must be done that will retard it. You cannot be over-cautious in the feeding. Some animals can be neglected for a day and not experience any ill effect, but a chicken is such a delicate piece of machinery that great care must be exercised always. When a chicken is born it weighs about 1½ oz., and in six months' time you want it to be a well-developed pullet of 4 lb. or more—that means that it has to make forty times its original weight in six months.

Chickens need no feed for at least forty-eight hours after incubation. Nature has provided for this period, as just prior to hatching the balance of the unabsorbed yolk is drawn into the abdomen, and under natural conditions this food supplies the chicken with its requirements until it has strengthened up. Feeding before this period sets up bowel trouble with the results of heavy mortality. Feeding should be done frequently—little and often is the best policy.

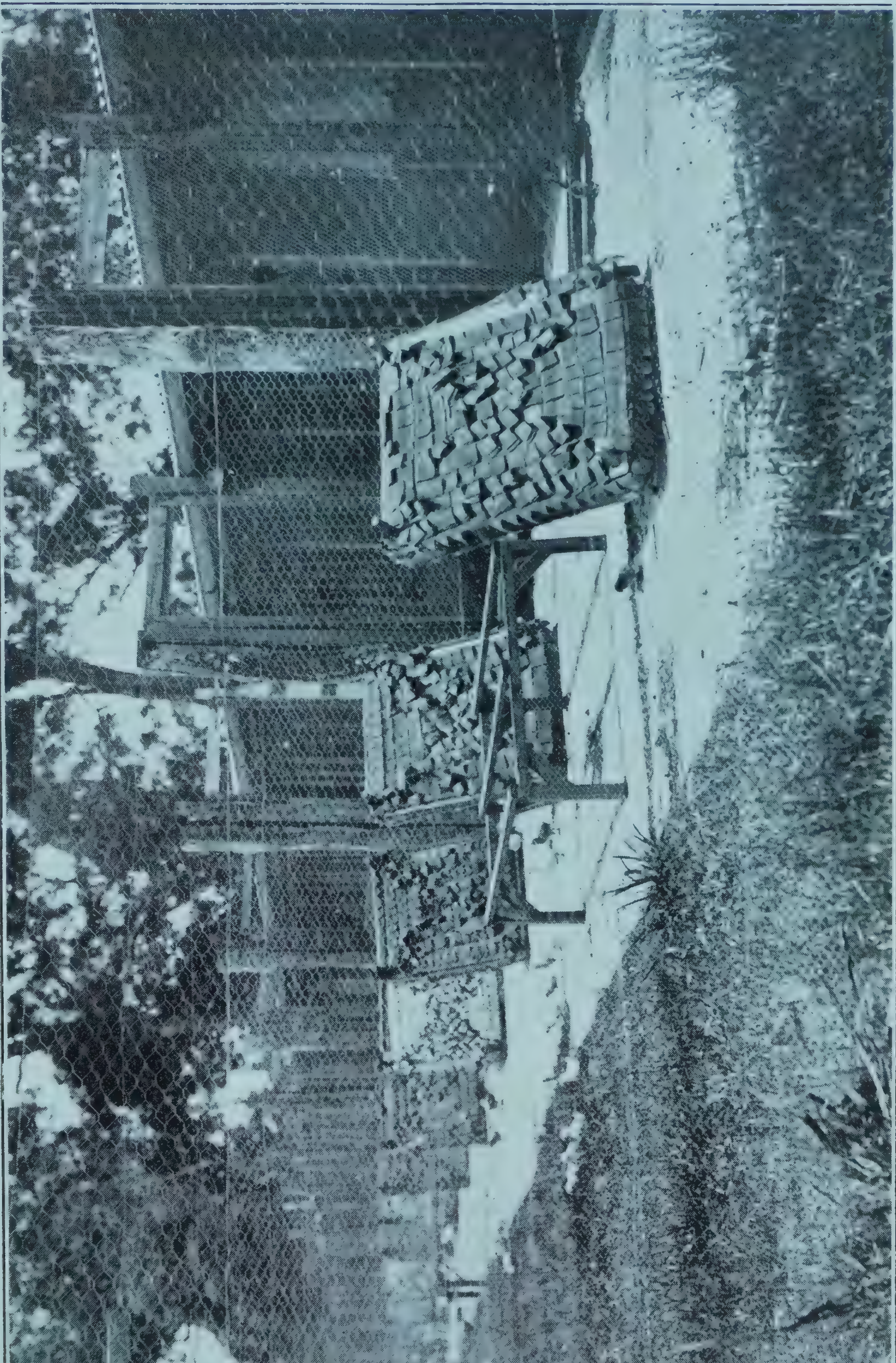


PLATE 138 (Fig. 2).—COLD BROODERS.

Showing numerous Cold Brooders being operated in a continuous house. Brooders taken from the house daily and placed in sun to air.

Kinds of Fowls.

In deciding upon the kinds of foods that are necessary for growing stock, it is desirable to have some idea of the constituents of the body of the animal, as they must all be derived from foods. Slight variations in composition exist, but there is always a certain approximation to the normal, full-grown animal.

Analyses made at the New York Experimental Station gave as an average of a leghorn hen 55.8 per cent. water, 21.6 per cent. protein, 17 per cent. fat, and 3.8 per cent. ash. This is the composition of the whole of the body—bones, blood, feathers, and viscera.

The egg, which is potentially a chick, shows a striking resemblance in analyses to the body of a full-grown bird. Of the dry matter of the egg, apart from the shell, 49.8 per cent. is protein, 38.6 per cent. fat, and 3.5 per cent. ash.

It will be seen, therefore, that about half of the dry matter of the whole body is protein and about 8 per cent. ash. This suggests that slow growth would follow the use of foods which contain small amount of nitrogenous and mineral matter.

Chickens at liberty consume large quantities of protein matter in the form of insect life, but it is not suggested that large quantites of meat-meal should be used. There are many excellent chick foods and growing mashes on the market, and it is questionable if it pays the individual to mix his own. Too many think it an unnecessary expense to purchase these foods, but, from remarks upon the necessity for the

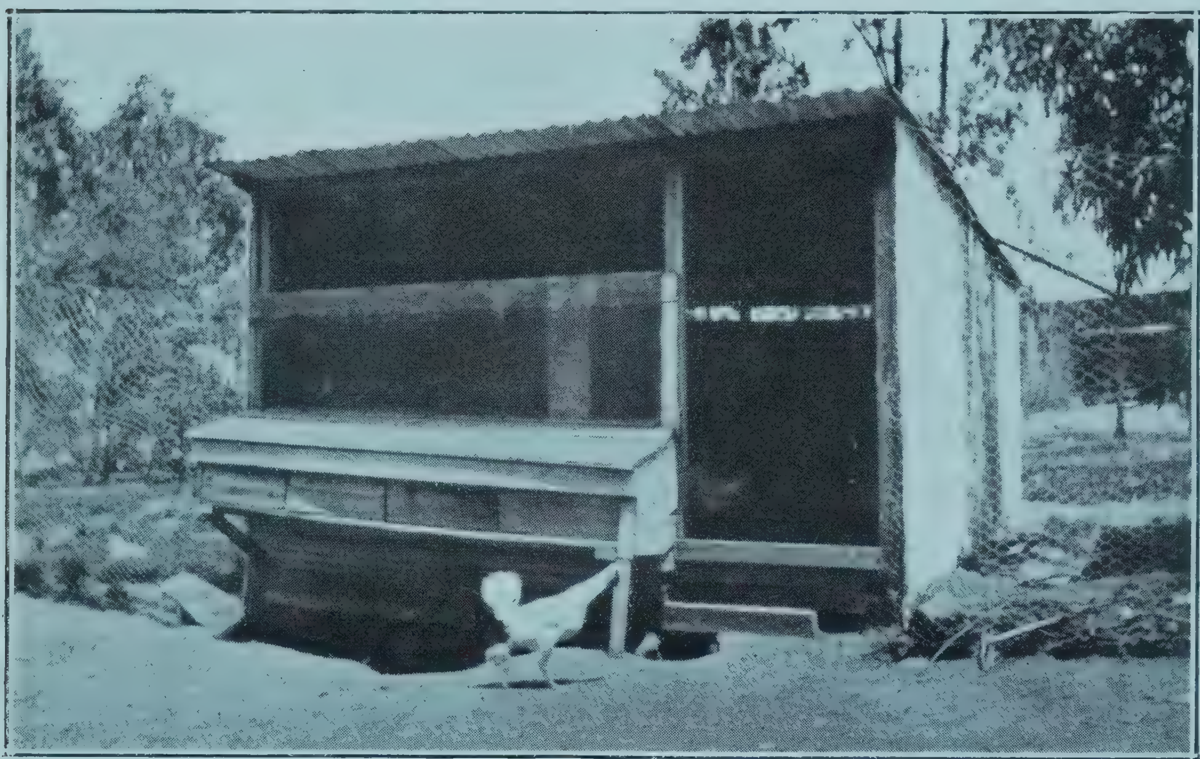


PLATE 139 (Fig. 3).—TYPE OF HOUSE SUITED FOR THE HOUSING OF CHICKENS AFTER LEAVING THE BROODERS

proper development of the stock and those upon the analyses of the bird, it is hoped that the necessity for the correct kinds of foods is demonstrated. Experience has taught us that a balanced ration is necessary for the feeding of chickens as well as for the production of eggs, and that this balance can only be made by using a variety of foods.

When the chickens are first placed in the brooder they should have access to grit or coarse sand. They will eat a little of this, and it will then be in the gizzard ready to deal with the food to follow. Grit should always be in evidence in the pens of chickens, and should consist of quartz or hard shell grit and charcoal.

Drinking water can be supplied immediately on leaving the incubator. This needs to be kept clean and replenished at least twice daily. The inverted bottle and tin is the cheapest water container.

For two days feed rolled oats on a bag or board. The chicks soon learn to pick this up. After this a mixture can be made of good cracked grains, such as hulled oats, skinless barley, wheat, and maize. Some of this grain should be scattered on the litter and the chicks taught to work for their living. This exercise promotes health, develops the bird, and frequently assists in checking the vice of toe-picking. From about four days a dry mash can be fed, composed of one part bran and two parts pollard. For every 20 lb. of the mixture add 1 lb. of the buttermilk powder and 1 lb.

bone-meal and 2 oz. of salt. In mixing the salt, do so with a small quantity of the food first, and then add this to the bulk. By doing this an even distribution is made.

From 6 *to* 12 *weeks.*—The buttermilk can be replaced by ½ lb. of meat-meal and ½ lb. of bone-meal. The grain could remain the same, only increased in size. This feeding can be continued until the chicks are twelve weeks of age.

From the 12*th week until laying.*—The grain can be increased in size until full-sized grain is consumed, and fed once a day. The mash can also be altered considerably by the use of lucerne meal. The mash then could be made of the following constituents:—Lucerne meal, 12 lb.; bran, 26 lb.; pollard, 56 lb.; meat-meal, 2 lb.; bone-meal, 4 lb.; salt to be added at the rate of 10 oz. to the 100 lb. of mash.

Green Feed.

This is essential for the best results, and can be fed after a couple of days. Chickens in their natural state, at liberty, consume large quantities of the most tender growth of grass, &c. Lucerne chaff and lucerne meal are excellent substitutes for green feed, but they are not a suitable food for chickens until they are about at least three months of age. The most suitable green feeds are the tender growths of barley, oats, &c. As the chicks grow they have rape, kale, or lucerne, but always feed it while tender and green.

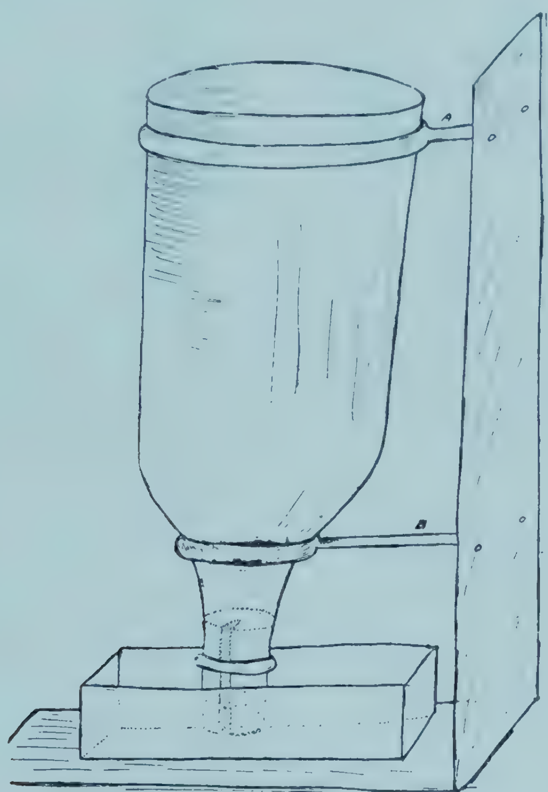


PLATE 140.—ROUGH SKETCH OF INVERTED BOTTLE AND TIN FOR WATER SUPPLY TO YOUNG CHICKENS.

The bottle is supported by means of two hoops of wire or hoop iron at A and B to a piece of light pine. The upright is nailed to a foot on which rests a shallow tin where the chickens can drink. A sardine or tobacco tin serves well. A cork, having a V piece removed its entire length allows, when the water in the tin has fallen below the level of the mouth of the bottle, the entrance of air thereby replenishing the water supply.

Milk Feeding.

On a farm there is frequently a surplus of skim milk which can be fed to chickens with advantage. Some interesting experiments were carried out at the College of Agriculture, West Virginia University, on feeding chickens, in which skim milk was used, and it was found that chickens fed on a ration where milk was used—

(1) Consumed more grain;
(2) Grew more rapidly;
(3) Laid earlier than chickens fed on similar foods without milk; and
(4) The mortality in the milk-fed chickens was not so heavy.

The milk may be fed in either a sweet or sour state. If sour, it is claimed by some authorities that it assists in preventing outbreaks of coccidiosis and white diarrhœa. Although dry mashes are recommended, small quantities of wet mash mixed with milk are very beneficial, and, where large quantities of milk are available, animal food in the form of meat-meal or buttermilk is not necessary.

BREEDS OF PIGS—THE TAMWORTH.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

Early History of the Breed.

Included in the list of breeds of pigs suited to the climatic conditions and environment of Queensland and to the requirements of both pig producers and the bacon factories, we find the Tamworth breed occupying a much more prominent position now than in former years.

Originally a gaunt, grey, gristly, rough wild type found in the forests and marshes of many of the Midland Counties of England, they were the first breed of pig our forefathers attempted to domesticate and make use of on their farms. The breed did not originate, as many Southern breeders imagine, in the district around Tamworth in New South Wales, but is the original old English native or wild type, taking its name from Tamworth on the borders of Staffordshire and Warwickshire, in England.

The breed has undergone a vast change, however, in recent years, and from the gaunt, grey, gristly, ferocious wild hog of England has been evolved one of the most attractive and profitable of all breeds—a type of pig in great demand especially for the purposes of bacon production in Australia.

The breed was for many years most numerously represented in England in the Counties around Birmingham, but latterly they have been distributed in large numbers to practically every pig-raising country in the world, and in Australia they have forged their way to the forefront in quite a remarkable manner.

Their Special Qualifications.

The Tamworth is pre-eminently a bacon pig, producing a maximum of lean meat from its long fleshy deep-sided carcass. Their popularity in recent years has been gained as a result of their usefulness on the farm for crossbreeding purposes—*i.e.*, for mating with Berkshire and similar medium types for the production of an ideal bacon pig of maximum weight and condition, and with a well-marbled, firm flesh of good quality such as is nowadays required by all bacon curers. The original intention of the improvers of this and other British breeds was not specially to produce this ''medium weight'' pig, but rather to improve the commercial value of the animal as it was in those days, and to increase both its size, weight, and productive capacity. As a matter of fact, they had a craze for size and weight, both very useful qualities, but both unobtainable without a certain coarseness in the flesh and bone, and with heavy feeding qualities.

The breed as they found it in the wild state exhibited a fierce temper; they were long, lean, gaunt, gristly, and much given to roving. They were not noted for any of the improved qualities which make the breed so successful to-day except constitution and an aptitude to withstand the harsh, rough conditions inseparable from the wild state in which they lived. The early improvers of the type, however, made use of these qualities, and by careful breeding, judicious selection and feeding, with reasonably good housing, they soon began to note that improvement which they so much desired. Then came the demand for size, and Tamworths were fed to enormous weights. The interest created by this craze led breeders to strive to outdo each other in their attempts to ''win the prize,'' and so gradually the conditions under which pigs had been kept were improved upon.

It was as a result of the success thus attained and with the general desire on the part of live stock fanciers for a better class of animal that the next forward step was made—viz., the introduction of the Chinese and Neapolitan breeds, the special objectives being the production of breeds similar to those we now know as the Berkshire and the several types of Yorkshires. The improvers of the Tamworth pig, however, did not approve of the introduction and use of foreign blood, and they stuck to the old type Tamworth and trusted to careful selection and improved methods of feeding and housing to produce the desired characteristics.

Early Importations.

The Tamworth breed was first introduced into Australia by Mr. George Chirnside, of Werribee Park, Victoria, and by the Department of Agriculture of New South Wales for the Hawkesbury College Stud. From the latter stud probably more Tamworth pigs have been distributed during the past twenty-five years than from

[*Photo: Courtesy of Water Conservation and Irrigation Commission, N.S.W.*]

PLATE 141 (Fig. 1).—GRAZING FORMS AN ESSENTIAL PART OF THE PIG'S UP-KEEP. PIGS GRAZING ON LUCERNE ON AN IRRIGATION FARM IN N.S.W.

This settler commenced operations with a purebred Tamworth boar and sow and several Berkshire sows. Note the crossbred (spotted) pigs and the parent stock (sows).

any other stud in Australia. Frequent importations have been made since the year 1900, though in recent years it has become quite a difficult problem owing to the embargo against the introduction into Australia of stud pigs from England and America; this on account of those countries having suffered severely from foot and mouth disease.

Tamworths were introduced into Queensland many years ago, and now there are several well known breeders specialising in and exhibiting at shows boars and sows of this famous old breed. The Tamworth has been sufficiently long in Australia to prove that our conditions are congenial to the breed, and that they occupy an important place in the industry.

The Present Day Type.

The Tamworth for many years was not a popular pig—even in his improved form—in the same sense as is the Berkshire. This was not due to any particular fault except perhaps his long nose, but to a general lack of knowledge of the breed and of their useful qualities. However, a wonderful change has taken place, even during the past ten years, and now Tamworths have forged ahead to quite a prominent position, and at our larger State and Interstate Agricultural Shows competition is very keen; the breed is rapidly increasing in popular favour, and the number of animals coming forward for registration in the Herd Book is on the increase.

Tamworths are distinctly "red" in colour, the variation in colour being from a golden-red hair on a flesh-coloured skin, to a dark red or brown, or even a yellowish shade. The colour varies also a good deal in its intensity. There are some types (not by any means desirable) which exhibit a very light yellow or a "ginger" shade, others the reverse; these are very unsatisfactory, and should be rigorously culled. The desirable and popular colour is a golden-red hair on a flesh-coloured skin, free from black splashes, spots or hairs.

In inferior types the conformation also varies, some of the older strains are of a "razorback" build, these are undesirable in every way and should not be tolerated; in fact, with the Tamworth more so than with any breed, only the very best types should be used and in order to ascertain what is the best, breeders should lose no opportunity of studying the types winning in our Royal Shows. The best class of Tamworth is one carrying a compact, deep carcase, well covered with a fine-quality flesh intermingled with a fair percentage of firm, white fat.

The young, growing Tamworth pigs might, to the inexperienced breeder, appear weakly and unthrifty; they certainly look "leggy" and narrow in comparison with more "blocky" breeds, but as they grow, they develop rapidly and fill out. This fault is not so noticeable in the crossbred—*i.e.*, where the Tamworth is mated with the Berkshire, &c., but they certainly require all the attention it is possible to give them, otherwise they will be less profitable than some of the other breeds. Tamworths must be forced along, particularly for the first four or five months, after that they are able to look after themselves better than most other breeds. These failings doubtless account somewhat for a certain timidity amongst breeders in taking up this type. The Tamworth sow invariably develops into an excellent mother, providing an abundant supply of rich milk for her numerous sons and daughters.

Of course, one finds "duffers" amongst this as amongst all other breeds. It is the individual animal that one must judge by, and not the breed, in making a choice of breeding stock. No breed should be condemned on account of there being "black sheep" in the flock.

Tamworths: A Hardy Vigorous Type.

The Tamworth pig does not suffer as a result of sunburn or sunscald, and they thrive in the warmest climates. This makes them especially suitable for our coastal and for the comparatively warm, dry, inland areas. They are, perhaps, not quite so suitable as the Large or Middle Yorkshires for colder climates. The "Tammy" does not like to have his ears "frost-bitten"; he prefers the warmer, more genial climes.

Tamworths have "big" appetites. Some breeders consider this a serious fault, and so it is insofar as a "cottager's" pig is concerned, and this applies in many ways to farmers keeping only one or two "sty" pigs; but to the man who is breeding pigs on a large scale and is feeding them on cheap home-grown foods and to the dairy farmer, it is not at all a serious fault, so long as the animal produces a reasonable amount of increase in weight for food consumed. For this reason it would not be correct to say that the Tamworth makes an ideal suburban pig farmer's type, for there are other breeds and crosses more suited to those conditions—*i.e.*, the Poland-China, the Middle Yorkshire, or the popular Berkshire—these are the types for the "city and suburban" man.

PLATE 142 (Fig. 2).—A THRIFTY, PROFITABLE LITTER.

This illustration of a large, thrifty, and profitable litter of Berkshire-Tamworth cross pigs, the property of Mr. George Stanfield, of "Stanberry," Wondai, indicates the wonderfully prolific nature of carefully selected strains of pigs. Mr. Stanfield states that the litter, fourteen in number, was eight weeks old at the time the photograph was taken. They were sired by a Berkshire boar purchased from Mr. W. Middleton, of Wyreema, and the dam is a Tamworth sow purchased from the stud at Queensland Agricultural High School and College, Gatton. Sows of this cross mated back to an unrelated Berkshire boar also give excellent results in the production

The Tamworth is not to be considered a profitable pig at all as a pure-bred (meat) market pig; he must be crossed with the Berkshire, Yorkshire, Poland-China, or possibly Duroc-Jersey to produce the best results. However, the Tamworth is growing in popularity as a ''stud'' pig, though there have been but few men specialising in these ''red'' pigs in Australia.

The Tamworth is not a pork butchers' favourite, and even the Tamworth crosses cannot be classed as porkers, though the writer has been forced to judge Tamworth-Berkshire crosses entered as porkers on many occasions at shows, and many dealers like their long fleshy carcases.

The Tamworth is the bacon breeders' ideal type for crossing purposes. The cross between the Tamworth and the several other breeds referred to above are model types if well fed and cared for from birth to maturity. The second cross (but not the mongrel)—that is a Berkshire boar mated with a first-cross Tamworth-Berkshire sow—undoubtedly produces a very fine type of bacon pig. Some curers and breeders like a ''dash'' of Middle Yorkshire in this type, and prefer the Yorkshire-Tamworth cross. The writer prefers to stick to the ''Black and Reds'' in these warm climates. All these are important considerations to be remembered when selecting breeding stock. One of the largest breeders of both market and stud pigs in South Australia (Mr. W. H. Bruce) reports wonderful success with the Duroc-Jersey boar crossed with Tamworth sows. Mr. Bruce slaughters many thousands of pigs annually for his shop trade, and has for many years been experimenting with a view to developing the most profitable pork and bacon pig. He considers this Duroc-Jersey-Tamworth cross the beau ideal of the butcher and curer. The writer also favours the Tamworth-Poland-China cross for the purpose indicated, these crosses providing an ideal and early-maturing marketable carcass.

Other Characteristics of the Tamworth.

Contrary to the opinion of some breeders, the Tamworth is a docile, tractable animal, responding, as all animals do, to the character of the treatment accorded them. The sows are possessed to a remarkable degree of the qualities of motherhood, including ease of conception and giving birth to large litters. They produce a liberal supply of milk, and are very attentive to their youngsters.

One writer has said that ''long-nosed pigs'' are always more prolific and develop into better mothers than short-nosed types; but, whilst there may be something in this, it is by no means true in the case of ''wild'' or ''bush'' pigs.

Discussing the Tamworth, one noted English writer says—''As all stockraisers are concerned in producing the best, and nothing but the best, it behoves them to seriously consider the breeding and feeding of the Tamworth pig for crossing with the common barn-yard type of sow, as they produce pigs of the very highest quality at a low cost.''

As a show pig the Tamworth has not up till within the past year or two had much to face in the way of competition at Australian shows, as the number of stud Tamworth breeders was limited, but recently with the increasing popularity of the type many other breeders have entered the field, and now competition is decidedly keen and payable prices are being obtained. When properly fed and prepared for the show ring the Tamworth ''makes up'' into a very attractive animal, commanding attention even from breeders who are adverse to their long body and nose.

It would however be well for the inexperienced breeder to learn all he possibly could about this type before going in too largely for them, especially from a stud breeder's standpoint.

Tamworth Eligible for Entry in the Stud Book.

Tamworth pigs, provided they conform to the recognised standards of the breed, and have been bred from registered stock (or stock eligible for registration), and are properly fed and cared for, may be admitted into the Herd Books of the Australian Stud Pig Breeders' Society, a local branch of which has recently been established. Registration is necessary if the parents or any of the progeny are to be exhibited at any of the Royal Shows or the larger country shows whose rules have been brought into line to provide for this. This registration of stud stock has had a powerful influence for good in the ''pig world,'' and no breed has benefited more than the Tamworth.

PLATE 143 (Fig. 3.)—AN OLD CHAMPION TAMWORTH BOAR "SANDY MACQUEEN."

A well-known Australian Prize Winner, until recently property of Mr. J. H. Whittaker, Broxburn Stud Piggery, Broxburn, *via* Toowoomba.

The principal characteristics of the breed, as set out in the standards adopted by The National Pig Breeders' Association of England, in whose herd books Tamworths may be registered, are as follows:—

STANDARD OF EXCELLENCE, TAMWORTH BOAR OR SOW.

(Revised January, 1925.)

Coat.—Golden red, abundant, straight and fine, and as free from black hairs as possible.

Head.—Not too long, face slightly dished, wide between ears, jowl light.

Ears.—Rather large, with fine fringe, carried rigid, and inclined slightly forward.

Neck.—Light, medium length, proportionately and evenly set on shoulders.

Chest.—Wide and deep.

Shoulders.—Light, free from coarseness, and in alignment with forelegs below, and with side as seen from in front.

Legs.—Strong and shapely, with good quality bone and set well outside body, pasterns short and springy, standing well up on toes.

Back.—Long and level, slightly arched traversely above shoulders.

Loin.—Strong and broad.

Tail.—Set on high and well tasselled.

Sides.—Long and deep.

Belly.—Straight underline, and in a sow a fair number of sound teats evenly placed.

Flank.—Full and well let down.

Hams.—Well developed, deep, full to hocks, and giving a tense appearance.

Skin.—Flesh coloured, free from coarseness, wrinkles, or black spots.

Action.—Firm and free.

In earlier standards of excellence several objectionable features in Tamworths were referred to. We list them here for the benefit of breeders not fully conversant with this type.

Objectionable Features in Both Boar and Sow.

Head.—Narrow forehead, kinked or upturned nose.

Ears.—Thick and coarse or drooping too far forward; loose and lopped ears are also objectionable.

Jowl.—Thick, coarse, and heavy.

Shoulders.—Coarse, heavy, or wide, and open at the top.

Ribs.—Flat or short curved, light back ribs.

Loin.—Narrow or weak.

Belly.—Flaccid, or wanting in muscle, gutty or podgy.

The Disqualifications Included—

Colour.—Black hairs or patches on the skin. (It will be noted these are still considered objectionable.)

In Boars.—Rupture, or only one testicle let down, vicious temper, coarse, wrinkly or ungainly.

In Sows.—Deficiency in or very irregularly placed or blind teats, injured or diseased udders, vicious temper, hollow back, coarse or heavy mane; poor breeding qualities.

THE TAMWORTH AS A BREED SUITABLE FOR CROSSBREEDING.

Experience in this State has demonstrated conclusively that there is no more suitable breed for the purposes of crossbreeding with Berkshires and similar types for the production of long, fleshy, deep sides and flitches of bacon. It has recently been computed by a number of leading English bacon curers that a long, deep-sided pig with fine shoulders, small jowl, and back of moderate width will produce as much as 10 per cent. less of lard parts and an accordingly increased ratio of lean meat. When it is borne in mind that fat (particularly here in Queensland) is only worth half as much as lean, it will be readily appreciated how the Tamworth excels as a remunerative commercial proposition.

PLATE 144 (Fig. 4).—CHAMPION PRIZE-WINNING TAMWORTH SOW "MANNING ELNORA" (213).

This sow appeals as one of the most typical and up-to-date Tamworths yet exhibited at Australian Shows. This sow was also a prize-winner at Brisbane Royal National Show. Note her compactness, width, and depth of ham and side and the fine quality hair and skin. An ideal type of breeding sow.

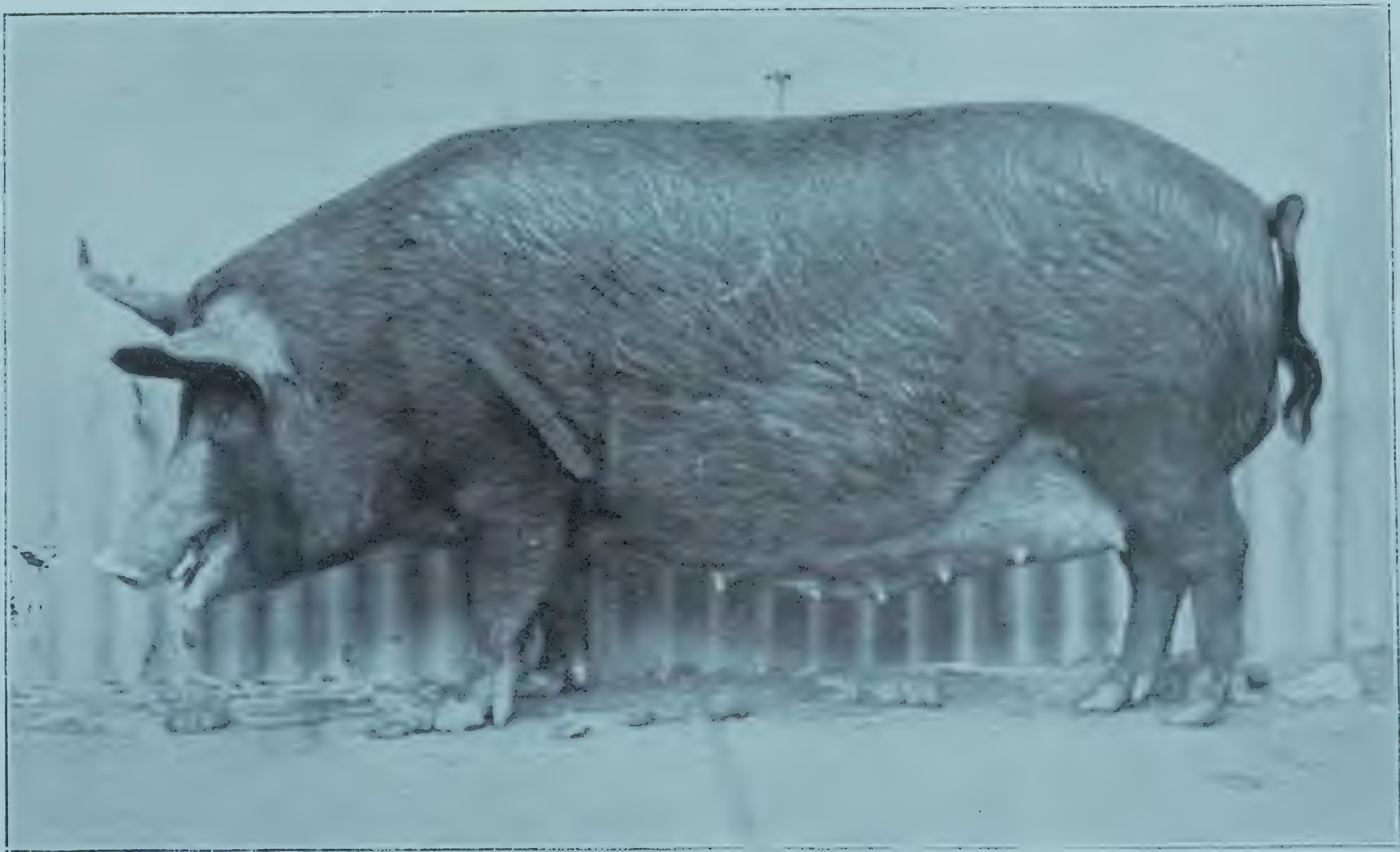


PLATE 145 (Fig. 5).—ANOTHER CHAMPION PRIZE-WINNER. MR. A. N. WHITE'S "ORARA LUCKY" (351)

A daughter of Manning Elnora figured in this issue. This sow was purchased by the Instructor in Pig Raising on behalf of Mr. G. H. Barnett, of Leeston, Canterbury, New Zealand. Purchase price 35 guineas, Sydney Royal Show, 1926. The photograph does not do the sow

Tamworths are good grazers, hardy and prolific breeders, often producing twelve or fourteen pigs at a litter (although ten is a good average). The sows are good sucklers and docile with their young. Apparently in consequence of its robust constitution the Tamworth is particularly free from all diseases, especially swine fever.

An ideal sow of the breed when fully grown should stand about 3 ft. 3 in. to 3 ft. 6 in. high, with a perfectly level side measuring about 4 ft. 6 in. from the point of the shoulder to the back of the thigh; belly close to the ground; while the hair should be fine and silky as indicative of best quality flesh; such a sow would have big hams and plenty of meat on the ribs, from where the best meat is obtained.

Discussing the twentieth century Tamworth in a neat, attractive brochure entitled "The Tamworth Pig of the Twentieth Century," the National Pig Breeders' Association of England, through its courteous, well-informed secretary, Mr. Alec Hobson, has this to say in regard to the modern type:—

"Although not so long as in former years, the nose of the modern Tamworth must not be short, in fact, anything approaching shortness or an inclination for the nose to turn up is very objectionable.

"For crossing with other breeds it is probable that the Tamworth has no equal, this no doubt being attributable to the fact that it is the oldest pure breed in Great Britain. Its type is therefore quite distinct, and its prepotency unequalled. Owing to the length and depth of its sides and other characteristics of the baconer the Tamworth is unexcelled for improving the flesh, fining the shoulders and reducing the jowls of many other breeds. Let it not be assumed, however, that the Tamworth is an uneconomical breed kept pure. Vast improvements have been made in every direction since Mr. Mander Allender, of the Aylesbury Dairy Company, swept the board with his Tamworths and Tamworth crosses at the Smithfield Club Show in 1884, 1885, and 1886, the weighbridge proving the value of this breed when pure, for at the Birmingham Fat Stock Show in 1911 there was only a slight difference between the Tamworths under nine months old and the Large Whites of the same age. The former, five in number, weighed 32 cwt. 1 qr., and the latter about 15 lb. more, a difference so slight that it is perhaps hardly worth mentioning. It is evident, therefore, that the breed can hold its own in the early-maturity classes of the twentieth century.

"A few more figures from Birmingham shows may be of interest: In 1912, eight pairs of Tamworths not exceeding nine months old weighed out at the very good average of 6 cwt. 0 qr. 2 lb. per pair, while the seven single pigs under twelve months old weighed within half a pound of the 28 imperial stone each. In the class for pairs not exceeding nine months old at the 1913 show, the winning pen weighed 6 cwt. 2 qr. 12 lb.

"Not the least significant event in the history of the Tamworth was the performance at Birmingham in 1920 when the breed captured the supreme championship against all breeds. The pen in question weighed 8 cwt. 0 qr. 17 lb. at 11 months, 3 weeks, and although not the heaviest pigs in the show their weight combined with quality gave them an easy lead.

"Previous weights at Smithfield reveal some interesting facts. In the year 1910, five pens—two in each—under nine months of age, averaged 6 cwt. 1 qr. 15 lb., while in subsequent years the averages for pens of the same age averaged as follows:—

1911	5 cwt. 0 qr. 17 lb.
1912	5 cwt. 3 qr. 11 lb.
1913	5 cwt. 2 qr. 12 lb.
1914	5 cwt. 3 qr. 2 lb.
1915	4 cwt. 3 qr. 24 lb.
1916	5 cwt. 3 qr. 0 lb.

"In the classes for Tamworths between nine and twelve months at the same society's shows, the following are the approximate averages of weight:—

1910	7 cwt. 2 qr. 4 lb.
1911	7 cwt. 1 qr. 17 lb.
1912	7 cwt. 0 qr. 22 lb.
1913	8 cwt. 2 qr. 1 lb.
1914	7 cwt. 2 qr. 16 lb.
1915	7 cwt. 2 qr. 9 lb.
1916	7 cwt. 2 qr. 10 lb.

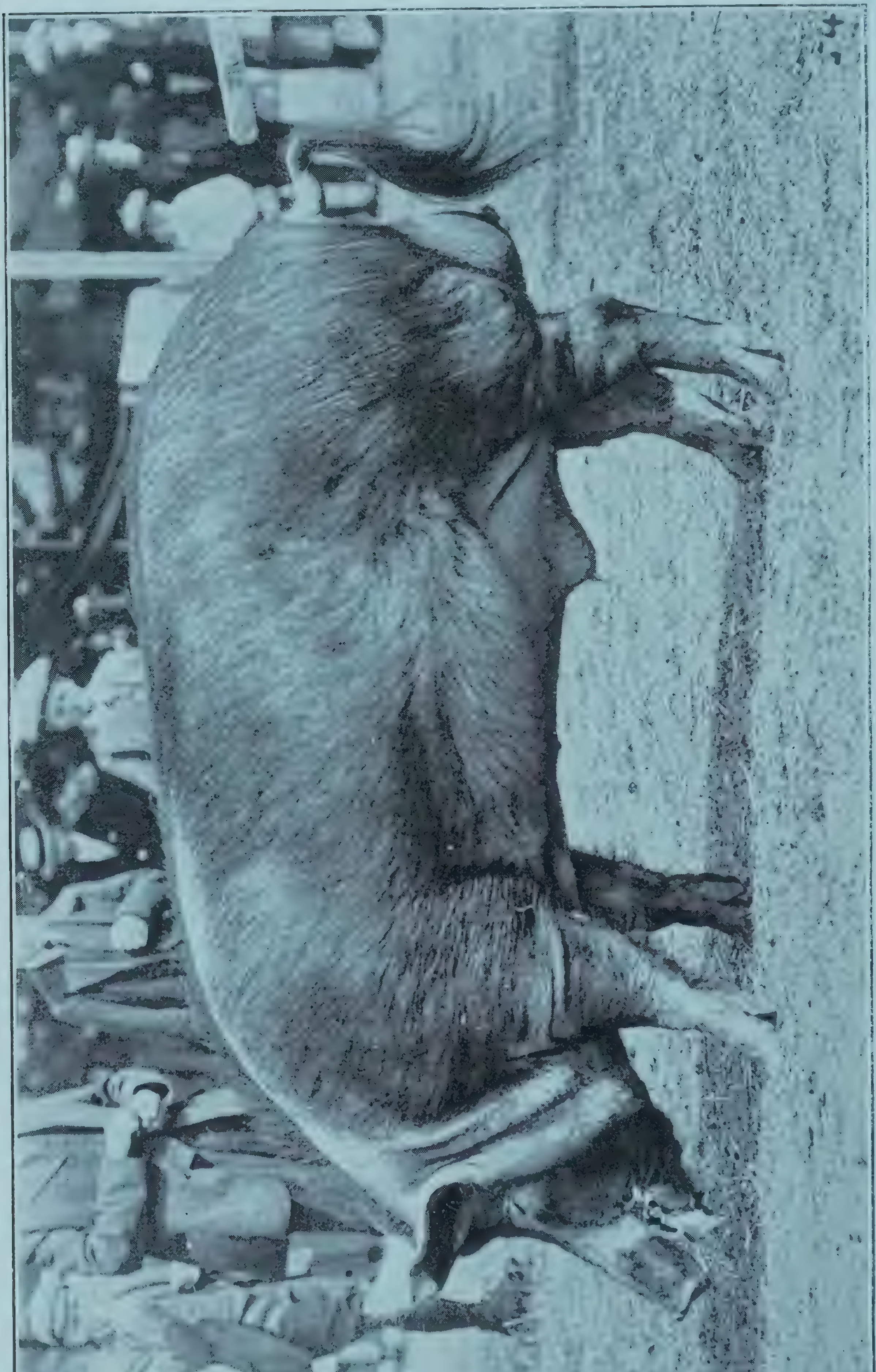


Photo. by courtesy Sport and General Press.]

PLATE 146 (Fig. 6).—TAMWORTH BOAR "KNOWLE SUNSTAR 2ND" (2978.)

Bred by the late Robert Ibbotson Knowle, Warwickshire, England. A prize-winner at Royal Show, Derby, 1925. This boar represents the type winning in most English Show rings at the present day. He is compact, thick set, carries a well developed ham and has a strong

"At the Smithfield Show in 1919 the pairs under six months old averaged 3 cwt. 22½ lb., while in 1920 the average for the corresponding class was 2 cwt. 3 qr. 1 lb., the heaviest pen scaling 3 cwt. 3 qr. 2 lb. At the same show the pens between six and nine months of age averaged approximately 5 cwt.

"From the above figures it is clear that the Tamworth more than holds its own with other breeds. Let it be emphasised, too, that the Tamworth is entirely English, no Neapolitan or Chinese blood having been introduced—a fact of which its supporters are justly proud.

"Wherever exported the Tamworth has made a great name for itself. Especially is this the case in the United States of America, Canada, and Australia, for it is essentially an open-air pig, thriving on rough and scanty herbage, in addition to being an equally "good-doer" whether in a hot or cold climate.

Facts.

"*Cross-breeding for Bacon.*—In crossing, the Tamworth may be wisely selected to put on any breed, but particularly the Berkshire, Middle White, or any compact small sow with a tendency to produce a somewhat fat-laden flesh.

"Writing on the Tamworth in recent years, Mr. H. W. Potts, the late Principal of Hawkesbury Agricultural College, Richmond, New South Wales, says:—

> The most satisfactory results have been secured all over Australia by crossing the Tamworth with the Berkshire sow. The resulting progeny mature quickly, and grow into an ideal bacon pig of about 130 lb. to 150 lb. live weight in six months. A similar result may be confidently secured from the Middle White Cross.
>
> In the matter of the acclimatisation, let it be understood that the term embraces the animal's power to accommodate itself to any change in external conditions of life, whether favourable or unfavourable, gradual or sudden. The Tamworth has been sufficiently long in Australia to prove that our conditions are most congenial to the breed.
>
> Here, in the midst of great open spaces, the Tamworth has the opportunity of developing its indigenous predatory instincts. They always were successful foragers, and in this regard they fully maintain their reputation. They thrive under rough grazing and outdoor phases of colonial life. Owing to the possession of an easy, active carriage, muscular development and hardy nature, they are more suited to travel distances to market than the fatter composite breeds, and avoid losing condition. It is also noticed that while their natural instincts favour grazing and life in the open, they respond well and profitably to forced feeding in styes.

Tests of the Breed.

"In relation to the tests conducted in the United States of America, evidence of the Tamworth being an economical pig is summarised in Bulletin No. 47 issued by the Department of Agriculture, Bureau of Animal Industry, and written by Mr. George M. Rommell. He states:—

> These experiments, taken in connection with the evidence of investigators over the entire country, undoubtedly show that the representative pigs of the different breeds do not differ materially either in the rate of gain or the economy with which the gains are made. Any marked differences in the breeds will be manifested in the suitability of the fattened animals for market, and the quality of the carcass on the block. A very notable feature is the showing of the bacon breeds when compared with the lard breeds.
>
> The fact that a pig is a Yorkshire or a Tamworth cannot be taken as *primâ facie* evidence that it will make slow and expensive gains."

Copies of the pamphlet entitled "The Tamworth Pig of the Twentieth Century" may be obtained gratis, with other information relative to the breed from Mr. Alec Hobson, Secretary, National Pig Breeders' Association, 92 Gower street, London, W.C. 1.

In Queensland the destinies of the Tamworth breed, as well as of all the other pure breeds of pigs, is being capably looked after by the local branch of the Australian Stud Pig Breeders' Society, in whose herd-books Tamworth may be registered. The local branch has recently issued a very fine well-illustrated booklet, entitled "Better Pigs on Every Farm." Copies of this booklet may be obtained gratis on application to the Secretary, Mr. R. G. Watson, Inns of Court, Adelaide street, Brisbane, whilst printed matter relative to this and other breeds and on the subject of pig raising may be obtained gratis on application to the Department of Agriculture and Stock, William street, Brisbane, Queensland.

DIARRHOEA OR WHITE SCOUR IN YOUNG PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

The following maxims have been compiled as golden rules for the breeder who wishes to ward off attacks of the above dread disease in his pigs:—

1. Be careful not to overfeed the sow immediately before or after farrowing or during the first ten days she is rearing her litter.

2. Watch that you do not feed sour decomposed or musty foods, and be careful also to keep musty, mouldy bedding out of the sow's sty.

3. Avoid changing the sow's food while she is suckling her litter unless it is found to be absolutely necessary; then effect the change gradually.

4. The moment any of the young pigs show the slightest sign of diarrhoea (scouring) reduce the sow's food supply by half, and compel her to take liberal exercise, the object being to reduce the quantity of milk she is producing. Some breeders believe that the sow should have one heaped teaspoonful of copperas (sulphate of iron) dissolved in hot water and placed in her feed; this will do no harm, and certainly would tend to reduce the supply of milk and tone up her system.

It is well to note that when the sow farrows she has an ample supply of milk (or she should have if she is in normal condition) for her progeny, and they soon reduce her normal supply; but some breeders in their enthusiasm and with a desire to give her a good time both before and after farrowing immediately increase her food supply and keep her trough well filled. Under this treatment the sow likewise becomes enthusiastic (it might be said) and produces heavier supplies of milk; consequently, the little fellows get more than is good for them or is necessary, and as their digestive organs cannot effectively deal with the extra supply, the result is that indigestion is set up and this is generally accompanied by inflammation of the stomach and intestines. The pigs then sicken and a feverish condition follows; the bowels refuse to act properly, and grey-coloured, evil-smelling, profuse diarrhoea follows. The young pigs do not immediately lose their appetites, but their condition gradually grows worse, and they begin to die off. The owner frequently thinks they are dying of starvation, and continues to force the sow with food so that she will produce more milk. The sow thus becomes overburdened with milk, and as the suckers gradually drop away from her she cannot get rid of it; inflammation of her udders follows and she also sickens, and will probably suffer to such an extent as to lose her supply of milk altogether. This is commonly referred to as milk fever.

It is necessary to remember that the stomach of the young pig is very small and they require small quantities of food only and at frequent intervals. They are, however, easily overdone and treating them is a difficult matter. To prevent trouble note that the sow should not be fed during the day she farrows; give her a thin gruel only, about eight or ten hours after farrowing, and very gradually increase her food supply after the suckers are born and until they are a week or ten days old. She must have sweet succulent green food, and ample exercise, and when the little fellows are ten days old they may be allowed to explore their surroundings, and gradually become accustomed to following the sow about. If, after all due care is taken to prevent the appearance of white scour in successive litters, it should occur and not yield readily to treatment, it would be better to seek veterinary aid, for the trouble may be due to infection.

To summarise: Immediately there is any sign of scouring in one or more of the young pigs, reduce the sow's food supply by half; compel her and the suckers to take exercise; give copperas in the food as advised; move the sow and suckers to a clean, dry pen, and feed the sow very lightly for a few days. If the ailment persists, give the sow a second dose of medicine (the copperas should be dissolved in hot water before being added to the food); give the suckers teaspoonful doses of castor oil each on the first day, and again next day if still scouring; sprinkle the floors and yards lightly with air slacked lime and keep them scrupulously clean; add a cupful of lime-water to the sow's food every day, and be careful not only to use sweet clean food, but also to place it in a clean food trough in a clean pen. Later, when the young pigs begin to feed "on their own," give them some lime-water, too; it never does them any harm so long as it is not used too freely. The lime-water is readily prepared by taking a tub or barrel, cleaning it out thoroughly, and soaking in clean water for a day or two. Then half-fill with clean rain water, and put about half a bucketful of air-slacked lime in the barrel, and after stirring water and lime together, allow to settle for several hours. It will be noticed that a thin "scum" floats on the surface, and that the water is as clear as crystal. As long as this scum forms daily, the lime-water is good; and the barrel can be refilled after use. Stir the lime up occasionally, and it will be good for two or three weeks at least. When the scum fails to appear on the surface, clean the barrel out, and start again with a fresh supply of lime and water. Never use an iron or tin container for this purpose.

Cleanliness is next to godliness in all matters relating to pig management. Common sense methods of feeding and care are also golden rules, and a knowledge of the cause and effects of the common diseases to which stock are subject will be of the greatest value at all times.

Boiled Rice as a Remedy.

Reference has been made in these pages on several occasions to the disease known as "scour" in young pigs (also called white or yellow scour or diarrhoea), one of the most troublesome of all the scourges to which the young pig is subject; it is likewise one of the most difficult to treat unless treatment is commenced early in the attack.

An American breeder, writing recently on this subject, recommends boiled rice and the water in which the rice has been boiled as a cure for the trouble. This is a very useful remedy; in the case of very young pigs a dessertspoonful of warm rice water two or three times a day will suffice; it must be given in teaspoonful doses as a drench, and the suckers should be kept away from the sow for at least two hours after dosing. Weaners that still have a good appetite should be given both the boiled rice and the rice water, and no other food should be allowed while this is being given.

Scour in young pigs is due in most cases to overfeeding, or to some abnormal condition of the sow's milk. The ailment can, to an extent, be checked by immediately reducing the sow's ration to an absolute minimum and by compelling her and the suckers to take plenty of exercise in the sunshine; they should also be penned in a clean, dry sty after exercise, and the sty in which they were kept should be thoroughly washed out with hot water, to which some coal-tar disinfectant has been added. It is useless treating the suckers unless attention is given to the sow.

It is advisable to carefully regulate the sow's diet in the treatment of scour; she should be given only sweet, clean nourishing foods of the best quality, and the rations should not be too liberal for the first few days after she farrows. As the suckers grow older they naturally require more food, and her supply should gradually be increased so that she can supply more milk.

Further information in connection with this and other diseases of the pig and in connection with pig raising generally may be obtained in pamphlet form from the Department of Agriculture and Stock, Brisbane, at any time.

QUEENSLAND SHOW DATES, 1926.

The following is the official list of Queensland Show Dates for 1926, as issued by the Queensland Chamber of Agricultural Societies:—

Hughenden: 8th and 9th June.
Beaudesert: 8th and 9th June.
Gin Gin: 8th to 10th June.
Mundubbera: 9th and 10th June.
Wowan: 9th and 10th June.
Woombye: 16th and 17th June.
Gayndah: Postponed.
Gladstone: 16th and 17th June.
Lowood: 18th and 19th June.
Mount Larcom: Postponed.
Rockhampton: 23rd to 26th June.
Gatton: 30th June and 1st July.
Kilcoy: 1st and 2nd July.
Biggenden: Postponed.
Mackay: 1st to 3rd July.
Townsville: 6th to 8th July.
Laidley: 7th and 8th July.
Woodford: 8th and 9th July.
Wellington Point: Postponed.
Charters Towers: 14th and 15th July.
Caboolture: 15th and 16th July.
Ingham: 16th and 17th July.
Mount Gravatt: 17th July.
Maleny: 21st and 22nd July.
Rosewood: 23rd and 24th July.
Ayr: 23rd and 24th July.
Ithaca: 24th July.
Barcaldine: 27th and 28th July.
Bowen: 28th and 29th July.
Nambour: 28th and 29th July.
Proserpine: 30th and 31st July.
Pine Rivers: 30th and 31st July.
Redcliffe: 4th and 5th August.
Sunnybank: 7th August.
Royal National: 9th to 14th August.
Crow's Nest: 25th and 26th August.
Coorparoo: 28th August.
Wynnum: 3rd and 4th September.
Imbil: 8th and 9th September.
Zillmere: 11th September.
Gympie: 15th and 16th September.
Beenleigh: 16th and 17th September.
Stephens: 18th September.
Pomona: 22nd and 23rd September.
Malanda: 22nd and 23rd September.
Esk (Camp Drafting): 24th and 25th September.
Melbourne Royal: 16th to 25th September.
Rocklea: 25th September.
Nundah: 1st and 2nd October.
Kenilworth: 7th October.
Southport: 9th October.
Enoggera: 9th October.
Balmoral: 16th October.
Brookfield: 23rd October.

Answers to Correspondents.

Supposed Poisoning of Stock by Grass-tree *(Xanthorrhaea).*

T.P. (Launceston, Tasmania)—

Reference supposed poisoning of stock by grass-tree (*Xanthorrhaea*), the Government Botanist (Mr. C. T. White, F.L.S.), advises that this plant has been popularly associated with the disease known familiarly in Queensland as the North Coast disease. A particular species only was blamed, *i.e.*, a swamp species (*X. hastilis?*), the others not being held responsible, particularly as the trouble was confined to the so-called "Wallum" country on the coast, on which cattle are put during dry spells. This country is very poor, and is composed of low, scrubby, typically Australian Xerophytic vegetation—open forests, plains, and swamps alternating. An account of this so-called "North Coast disease" will be found in the report of the Chief Inspector of Stock for 1919-20, embodied in the Annual Report of the Department of Agriculture and Stock, Brisbane, for 1919-20, p. 68. Later however, the same trouble was found inland at several places, where a grass-tree of another species was growing in abundance (*X. quadrangulata?*).

Most trouble occurred during the late spring and summer months and it is thought that as the cattle eat very freely of the flowering poles, these might be the cause of the trouble, and feeding experiments were commenced at the Stock Experiment Station, Yeerongpilly. These proved negative, but being started late in the season cannot be regarded as very conclusive.

Stock also eat the white heart of the plant, and this also should be experimented with.

Grass-trees have been suspected of being poisonous to stock in New South Wales, and in the "Agricultural Gazette" of New South Wales, Vol. VIII., p. 22, J. H. Maiden quotes J. S. Allen as saying that the settlers in the vicinity of Jervis Bay had informed him that the shoots of the grass-tree, when in blossom, and eaten by cattle, gave them a complaint —"cripples." It appears to affect their joints and doubles them up.

In the same Journal for January, 1914 (Vol. XXV., p. 69), Dr. J. B. Cleland gives the results of feeding tests with the grass-tree leaves at Milson Island. These proved negative.

The whole question of grass-tree poisoning wants much further investigation, in which the botanist, chemist, and veterinarian must co-operate. On some better class grass-tree country, we have reports that cattle, during dry spells, feed freely on grass-tree without any ill-effects following; so it is quite possible that there is some relationship between the trouble and the class of country over which the cattle are running.

Duboisia Leaves.

O.P. (Atherton)—

Re Duboisia leaves, the Government Botanist (Mr. C. T. White, F.L.S.) advises that these are the produce of a native tree, *Duboisia myoporoides*, fairly common in coastal Queensland. It often comes up very thickly as a second growth on scrub farms. The leaves are somewhat poisonous but are rarely, if ever, touched by stock. They are rather fleshy, and dry to paper thickness; the price varies, according to demand, from about 1s. to 2s. 6d. a lb. The demand is limited. Particulars of buyers of these leaves could probably be obtained from the Principal, Pharmacy College, Brisbane. The tree is sometimes known as "Corkwood," due to the thick, corky bark of the old trees, and the light weight of the wood. The trees are most abundant as second undergrowth, and are of robust growth; light green trees and the young stems often coloured purple. If you are not sure of the tree, send Mr. White specimens and he will tell you if you have the right thing or not.

Antarctic Beech *(Nothofagus Moorei).*

C.C. (Beechmont)—

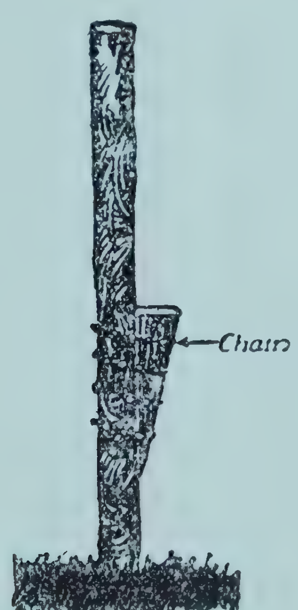
Reference to the age of the Antarctic beech trees of the National Park, the Government Botanist (Mr. C. T. White, F.L.S.) advises that this tree, as you know, is the dominant tree at altitudes above 3,000 feet in the National Park, and the reason why it has survived in this spot is probably climatic.

The only other place where the tree is found is on the higher parts of the Dorrigo, in New South Wales. The botanical name of the tree is *Nothofagus Moorei.* Nothofagus is a genus of about twelve species found in the southern parts of South America, New Zealand, and Australia. Three species are found in Australia, one is an Alpine shrub in Tasmania, another is the Beech Myrtle of Tasmania and Victoria, the third is our "Antarctic Beech," as it is known in New South Wales—"Negro-head Beech."

The genus is of great interest to botanists as representing one of the few examples of the so-called Antarctic or Fuegian element in the Queensland flora. It reaches its northernmost limit of distribution in the Macpherson Range; its present distribution shows its species to be among the most southern of trees and tertiary leaf impressions show it to have at one time inhabited the Antarctic Continent, where at present only two flowering plants are found—a grass and a small herbaceous plant. Regarding the age of the trees, I am afraid it is very hard to express a definite opinion; they must be very, very ancient, but the actual age is difficult to ascertain, as in the older trees you will notice that the central part has rotted away and young trees spring up as root-suckers all round. This means that it is impossible to get at the age of the trees by the annual rings, though these in Australia are of rather doubtful value in assessing the age of trees.

DRIVING POSTS.

In light country, posts may often be driven into the ground; but if a maul be used for the purpose on the head of the post this will usually result in splitting it. If the method of driving posts shown in the illustration from "Country Gentleman" is used this will be avoided. A long, wedge-shaped piece of hardwood that may be cut from the end of a piece of lumber or a small log is chained against the post



with the point of the wedge down. The post is then driven by driving the head of the wedge. This method has another advantage. Often very slender posts are put in for light fences. They are very hard to drive if driven from the top. By this method they may be driven quite easily. Crooked posts may also be driven by this method.

General Notes.

Butter Board.

An Order in Council has been issued amending the constitution of the Butter Board, by declaring that the persons to appoint the growers' representatives on the Board shall be the cream suppliers to the factories, and such cream suppliers will also be eligible to vote on any referendum or election held in connection with the said Board.

Arrowroot Board.

The counting of votes in connection with the election of five members to the Arrowroot Board resulted as follows:—

Lahrs, Johannes (Norwell)	68
Clark, Alexander (Pimpama)	65
Henderson, Alexander McGregor (Redland Bay)	65
Stewart, Robert (Ormeau)	64
Oxenford, William Frank (Oxenford)	55
Peachey, Benjamin George (Ormeau)	54
Schipplock, Wilhelm August (Norwell)	34

The elected members will hold office for one year.

Staff Changes and Appointments.

Mr. J. A. Michelmore, of Mackay, has been appointed Owners' Representative on the Northern Coast Opossum Board.

Mr. Frederick Bostock, of the Hawkesbury Agricultural College, has been appointed Assistant Instructor in Pig Raising, Department of Agriculture and Stock, Brisbane.

Mr. H. L. Hall has been appointed Canegrowers' Representative on the Proserpine Local Sugar Cane Prices Board, *vice* Mr. W. B. Biggs, resigned.

Constables A. MacDonald, C. F. Cott, J. T. Morris, and W. Leamy, of Yungaburra, Blair Athol, Millaa Millaa, and Blackbutt respectively, have been appointed Inspectors of Slaughter-houses.

Constable H. Skipper has been appointed Temporary Acting Inspector of Stock during the period he is stationed at Ravenshoe.

The resignation of Mr. L. W. Ball as Manager, Cotton Experimental Farm, Melton, has been accepted as from the 12th May, 1926, as tendered.

The resignation of Mr. W. C. Stables as Honorary Inspector, Diseases in Plants Acts, has been accepted as from the 13th May, 1926, as tendered.

Messrs. R. P. M. Short, W. C. Carmody, C. Queale, J. Nicholson, W. H. Crank, R. T. Cridland, E. J. Tannock, S. J. Monaghan, and W. R. Holmes have been appointed Collectors of Royalty on opossum skins, at the centres at which they are at present stationed, viz.:—Brisbane, Brisbane, Brisbane, Brisbane, Rockhampton, Rockhampton, Emerald, Mackay, and Townsville respectively.

The appointments of Messrs. A. Hossack, D. J. Callaghan, and J. W. Mackay as Inspectors of Dairies have been confirmed as from the 1st November, 1925.

Messrs. R. J. Rollston and C. J. Boast have been appointed Assistant Inspectors of Cane Testers for the 1926-27 crushing season.

Mr. Fred Bostock, of the staff of the Hawkesbury Agricultural College, Richmond, New South Wales, has been appointed assistant to Mr. E. J. Shelton, Instructor in Pig Raising, and has entered upon his work with the Department of Agriculture and Stock. Of a well known Meadowbank (N.S.W.) family, Mr. Bostock was born in 1902. His early education was obtained at the Ashfield Technical School and the Sydney Technical College. A sound training in general farming practice was received at the Bathurst Experiment Farm, where, in addition, Mr. Bostock made a special study of pig-raising as a result of which he had no difficulty in qualifying by examination for the Piggery Certificate of the Hawkesbury College. In 1922 Mr. Bostock was appointed Assistant Piggery Instructor at that institution. In his new appointment he will have ample scope, for the pig raising in Queensland is a profitable and rapidly expanding industry. Last year's official figures show that sales of Queensland bacon, hams, and other pig products were considerably over £1,000,000 in value, and at the present rate of progress these figures must soon be doubled.

Americans Eating more Butter.

It is reported that monthly consumption of butter in the United States has increased nearly 30,000,000 lb. since 1920, according to figures compiled by the United States Department of Agriculture. Consumption in 1925 is estimated at 159,000,000 lb. a month compared with 130,000,000 lb. in 1920, being an increase of over 22 per cent.

Egg Board Levy.

Regulations have been approved under the Primary Products Pools Acts, empowering the Egg Board to make on all persons delivering eggs to such Board, a levy at the rate of ½d. per dozen eggs so delivered, as from the 1st July, 1926. Provision is made, however, for egg growers (as defined in the Order in Council constituting the Board) to make a petition for a poll to be held to decide whether the levy shall be made, and such petition must be signed by at least fifty growers of eggs, and must reach the Minister on or before the 30th June, 1926.

Sterility in Pigs.

A great many of the cases of sterility and barrenness in pigs are due to the animals being in an over-fat and lethargic (lazy) condition. There are many instances also in which the boar is in an over-fat condition and lacks sexual vigour. It is unfortunate that many strains of pigs, particularly purebred pigs, have been practically ruined through being kept in very fat show condition for exhibition purposes over lengthy periods; it is equally unfortunate that many of their progeny suffer as a result and fail to breed satisfactorily if they breed at all. These conditions can very largely be overcome by reducing the condition, first by a lessened diet, by the use of green foods, and also by compulsory and regular exercise. Frequent doses of Epsom salts should be given, using from two to four ounce packets per dose in half a pint of warm water, preferably as a drench first thing in the morning. The pigs should be compelled to hunt for part of their living by grazing over good-sized grassed pig paddocks, 1 acre or more in area. Such green foods as lucerne, burseem (Egyptian clover), sorghums, pumpkins, rape, and barley, root crops like sweet potatoes and artichokes, &c., are suggested. Some cases of barrenness are due to septic inflammation of the womb, the result of germ infection due to stock being kept in unclean sties and to boars serving clean sows after having bred to sows suffering from infectious diseases of the womb. In these cases and in all cases where the sows will not hold to the service of the boar it is advised to syringe the uterus out with a solution of one teaspoonful of table salt in one pint of sterile water, *i.e.*, water which has been boiled and allowed to cool down to blood heat. If this does not give satisfactory results try 20 grains of permanganate of potash in one pint of sterile water at blood heat, and follow up with the salt solution every day for three days before service; during treatment also give Epsom salts as recommended above. It is advisable also, if at all possible, to change the boar, using a young vigorous animal. The sows should be kept away from the boar until they are ready for service, and after being stinted they should be immediately taken away and be placed in a clean dry sty, away from all other pigs, and they should be kept very quiet for several hours. If they still seem restless mate them again the following evening and follow same suggestions re separation. Sterility and barrenness are also often induced through the animals being improperly nourished and through their lacking stamina and vitality.

Many sows commence stud duties too young, many boars also are ruined in this way. Neither should be used for stud purposes before ten or twelve months old. Hereditary influence plays an important part, the progeny of shy breeders often failing to breed at all. Injuries to the sexual organs of the male is also a frequent cause of the sows not proving in-pig. The boar may have become weakened through frequent unsuccessful attempts at service—this especially so where a young boar is running with a lot of full-grown sows. The boar in this case is often punished severely by the sows chasing and biting him or by keeping him away from the food trough. It frequently happens that a young boar so injured becomes so "cowed" that he is ever afterwards afraid and he becomes quite effeminate. There are many other causes, too, such as the use of improperly-balanced rations, disease of the breeding organs of the boar, hot, dry, droughty seasons, and so on. The remedy lies in the removal of the cause wherever that is possible and in culling out unsatisfactory breeders.

Messrs. Arnold and Co., Veterinary Medicine Suppliers, of Sydney, advertise what they refer to as a very satisfactory remedy for the treatment of pigs that are unsatisfactory breeders. It should be worth writing them for a trial package, though in a general way we do not recommend the use of medicinal agents for the purpose indicated. It is regretted we do not know of a reliable "cure all" for these troubles, but will be glad to supply any further information required.—E. J. Shelton, Instructor in Pig Raising.

Potatoes—Exports and Imports.

Regulations under the Diseases in Plants Acts provide that no potatoes shall be exported from or imported into Queensland unless a certificate is obtained from an inspector of the Department of Agriculture and Stock that such potatoes are free from Irish blight, potato blight, or late blight, brown rot, storage rots of potatoes, potato tuber moth, eel worms or nematodes, potato scab, Colorada potato beetle, or any other injurious insect or plant disease to which potatoes are subject. It is further provided that such potatoes shall be packed in new bags or cases, or in clean cases that have not been previously used for holding potatoes.

Bunchy Top in Bananas.

Provision has been made by regulation under the Diseases in Plants Acts, that every occupier, or if there is no occupier, the owner of any land whereon banana plants are or are growing, shall immediately notify the Department of Agriculture should the disease known as ''bunchy top'' in bananas be present in any banana plants on his land or hereafter make its appearance on any such plant.

As a result of a Proclamation issued under the abovenamed Acts, the removal of any banana plant from or out of any nursery, orchard, or other place, is absolutely prohibited from the 29th April, 1926.

Gympie Butter Factory—Largest in the World.

There is a good deal of truth in the saying, ''He who stands still goes back,'' and it may also be applied to agricultural districts. Notwithstanding the great over-production in sugar, and the fact that the districts north of Townsville have increased their ''sweet'' output in fifteen years from 57,135 tons to 215,550 tons, and increased their acreage more than 100 per cent., the Innisfail districts are splashing out to have more than one string to their bow. A move is being made to have a butter factory at Silkwood, and it is reported there would not be the slightest difficulty in disposing of 4,000 shares at £1 each, the money to be raised from settlers prepared to milk 700 cows. There are large areas of Crown land—some 10,000 acres—lying idle, and a move is on foot to have it thrown open for dairying. Mackay is moving on similar lines, and a report is being made as to the suitability of the district for dairying. What is being done on the Burdekin to get out of the rut?

Gympie, one of Queensland's leading goldfields of the past, has the largest butter factory in the world, and while on a recent visit to Queensland the Danish Director of Dairies said he was astounded at the magnitude of the factory and its excellent construction, lay-out, and plant. He had not, he stated, seen anything like it in his travels round the world.

In the factory all the most modern dairy machinery and appliances have been installed, and it stands as a monument to the enterprise of the dairymen of the Gympie district.—Abridged from a report in the ''Home Hill Observer'' reprinted from the ''Gympie Truth.''

The Sugar Crop.

Owing to the unfavourable weather which has prevailed in most of the sugar areas (states the Acting Premier, Hon. W. Forgan Smith), the crop (which early in the year promised a yield nearly as large as last season's output of 500,000 tons of sugar) has been considerably reduced, latest estimates indicating a production of about 420,000 tons of sugar.

At a conference of canegrowers held at Mackay in January last, resolutions were passed recommending a scheme of allocation under which each mill would be entitled to produce at the Australian price a quantity of sugar based upon the average of its production for last season and its estimate for the coming season.

The resolutions were ultimately presented to the Minister for Agriculture by the Queensland Canegrowers' Council, and the matter has been considered by the Government, but there has not yet been an opportunity of going fully into the scheme, which may involve certain legal and legislative action should it be decided to give effect to the proposals. There is also the necessity of consulting interests other than the growers in the matter. As this could not be done in time for the coming season, a proclamation is being issued under the Sugar Acquisition Act acquiring the sugar as hitherto, the only difference being that, whereas last season sugar was acquired on the basis of 60 per cent. for Australian use and 40 per cent. for export, the proclamation now being issued will provide for 70 per cent. of Australian price and 30 per cent. for export, subject to adjustment at the end of the season when actual tonnages will be known.

Pest Destruction—An American Method.

Details are made available by the Federal Department of Markets and Migration, Melbourne, of a method employed by the United States Department of Agriculture of "baiting" insect pests that they may be the more conveniently killed. The plan apparently is to put out bait which will draw them to a common centre, and then to apply a toxic spray.

The latest attractive agent is known as geraniol, and it has been employed successfully in fighting the Japanese beetle which has invaded New Jersey and other portions of the country. Its utility in this connection was demonstrated during the course of an observation tour conducted in New Jersey recently, when a party consisting of a number of orchardists and entomologists especially interested in the work of the Japanese Beetle Laboratory of the Bureau of Entomology visited about 100 acres of demonstration orchards (peaches, apples, cherries, and grapes), on one of which properties the demonstration was held. The attractor was used to draw the beetles into a limited area as described, where they were destroyed with a spray consisting of oleoresin of pyrethrum and soap. This has been developed at the laboratory during the past season and has given remarkably good results, according to the department.

Proposed Celotex Industry for Queensland.

The Premier (Hon. W. McCormack) has received definite word from America that the proposal for the establishment of the celotex industry in Queensland has not been dropped, and that a representative of the celotex company will be in Australia shortly.

Mr. McCormack said recently that he had received the following cablegram from Mr. H. C. Armstrong, of the Celotex Company, New York:—

"Sir Matthew Nathan indicates that you are under the impression that the celotex project has been dropped. Kindly assure the Government that I have never deviated from my intention to carry it through. A great extension of the operations in America and various new activities, including the formation of a company in England, where considerable celotex construction is proceeding, have involved a large additional capital expenditure, and have prevented the departure of the president for Australia. I thought you were informed of the position. I have the keenest appreciation of the Queensland Government's assistance in the preliminary work, and beg you to accept my assurance that all doubt is eliminated regarding heat and cold resisting qualities. We are satisfied that the Queensland canefields will supply large proportion of the Australian softwood needs with marked improvement in future living conditions. I am having the privilege of entertaining Sir Matthew, and showing him the results achieved here. I will leave for Australia shortly with a full programme."

The Value of Herd Testing.

The dairy industry of this State is of an annual value approximating seven millions sterling, and is expanding rapidly throughout the State on coastal, tableland, and downs areas. Once this industry becomes established in a district other professions, trades, and businesses follow, and thus are created centres of rural and commercial activities.

There are upwards of 500,000 cows used for the purpose of dairy farming in this State, including herds of Jersey, Guernsey, Ayrshire, and Milking Shorthorns. Individual cows of outstanding dairy character and producing ability are met with in many of our dairy herds in this and other States of the Commonwealth. The world's greatest producer of dairy products, "Melba XV. of Darbarla," is one of many famous dairy cows bred on the Darbarla Estate under the direction and control of that wizard in the breeding of high-producing dairy cattle, Mr. Cole.

While we claim excellency in dairy production for individual cows of the leading dairy breeds, we have to admit that the average production of our dairy herds is much below that of the dairy herds of other countries in which the dairying industry occupies a prominent position. It is the team work of the dairy herd, and not the outstanding dairying capabilities of one or two individuals of the herd, that ensures success. The herd tester is the reliable selector of a profitable dairy herd.

The herd is the dairy farmers producing plant, and must be organised, controlled, and directed, so that efficiency may be secured and his business thereby placed on a profitable basis.

The present is a time of rapid progress, the result of scientific research as applied to our varied industries including that of dairying.

One would not attempt to enter the building trade with a broad axe and a saw for a construction plant. Some of our pioneers so equipped built their homes, but conditions have changed and more efficient methods are now adopted.

Are any of our dairy farmers of to-day broad-axe dairymen carrying on their business with an out-of-date plant dairying a herd with a production below the payable line? Let the herd tester with the aid of a Babcock tester scales determine this question of production. Systematic testing of the dairy herds is the chief factor in securing a payable return for each cow milked and cared for on the farm.

Production of large quantities of milk is a characteristic of dairy cows bred on dairy lines from generation to generation and cared for so as to develop dairy character.

You may feed a liberal dairy ration to a cow but she will not respond in production of dairy products if she does not possess dairy characteristics.

Every dairy farmer should ascertain the cost of producing milk on his farm. Having fixed on a payable production basis per cow, he should then by systematic herd testing find out which cows are being dairied at a profit and those that are being kept at a loss. The time has arrived when unprofitable cows should be removed from the dairy herd and from off the dairy farm.

Guesswork methods must give place to the efficient, businesslike system of determination of the relative values of dairy cows. The stability and progress of the industry depends upon an efficient system of herd testing. Herd testing associations will play an important part in placing the industry on a more profitable basis.

The herd testing scheme conducted by the Department of Agriculture and Stock provides for the testing of dairy herds free of cost to the dairy farmers. Many Local Producers' Associations throughout the State are co-operating with this Department in the carrying out of this work.

During 1925 testing season 994 herds located in various centres throughout the State and comprised of 21,918 cows were tested by departmental officers. The average daily yield of milk per head of all cows tested was 16.79 lb. The highest producing herd averaged 46.1 lb. per head per day, while the average daily yield of the lowest producing herd was 6.5 lb. of milk. One cow produced 65.25 lb. of milk in twenty-four hours. The average daily yield of butter fat per head of all cows tested was .68 lb., and the highest daily yield was 2.28 lb., and the lowest .13 lb. of butter fat.

A comparison of the average production of the highest producing herd with that of the lowest producing herd, and by comparing the highest individual yield with the average and lowest yield, provides convincing evidence that there are many cows at present being dairied at a loss throughout this State.

A dairy farmer can raise the production capacity of his herd by adopting the Department's herd-testing scheme, and increase his income considerably.

The records supplied by the official testers will provide a reliable basis on which to cull out unprofitable animals. Herd testing is an essential in the conduct of the dairying business, and will prove a valuable aid to the dairymen of this State.—C. McGRATH, Supervisor of Dairying, in a radio talk to farmers.

Storing Lemons—Efficacy of the Borax Treatment.

Some evidence of the efficacy of the borax treatment for the prevention of blue mould of lemons in store was afforded by an experiment conducted by the Wyong Packing House. On 20th November two bushels of lemons were picked (pulled) and were at once dipped in a 5 per cent. solution of borax at 115 degrees Fahrenheit for five minutes. They were then placed in unpapered old gin cases and stored in an ordinary shed alongside six cases of lemons picked from the same trees by the same grower, but untreated.

On inspection about five days later from eight to fifteen lemons were affected with blue mould in each of the untreated cases, but only one lemon was "mouldy" in the treated fruit, and that was due to a puncture by a protruding nail in the case. The untreated lemons were then sold, as they showed no keeping qualities, but on 24th December the borax-treated lemons were still in excellent condition and were curing splendidly, having changed from their green colour to a light yellow.

Great possibilities appear to exist for borax as a steriliser, as not only is blue mould apparently defeated, but the oil cells in the rind seem to be filled with the chemical and to retain their firm or turgid condition much longer.—"Agricultural Gazette," New South Wales.

Rabbit Extermination.

An interesting test of the Langvarwill Rabbit Exterminator was recently carried out at the Zoological Gardens, Melbourne, before Sir Victor Wilson, Minister for Markets and Migration, some of the Zoological authorities, including the Director, Mr. Wilkie, and a number of pastoralists and business men.

According to the inventors the main feature of the destructor, which is manufactured in two models—one horse-drawn and the other motor mounted—is a cylindrical pipe brick-lined furnace in which a wood fire is lighted and a bed of burning charcoal formed. The inventors say that on the engine being started a suction fan draws atmosphere from the top of the cylinder through the charcoal. The oxygen is burned and the ultimate result is the formation of nitrogen and carbon monoxide which is drawn across water through cooling pipes and forced under pressure through steel hose into the mouth of the rabbit warren.

During the test in question, live rabbits were first placed in a glass case into which the gas was forced. It was found that all the rabbits were killed in 30 seconds. A rabbit warren was then treated and gas forced in for about a minute. The warren was subsequently opened and all rabbits discovered were found to be dead.

The inventors claim that all that is required to produce the gas is ordinary wood fuel, and that the operating costs are low.

Turkey Raising.

Turkey raising in this country is almost exclusively confined to the rearing of comparatively small numbers on farms and stations. No success is known in ''farming turkeys'' in the same sense as poultry farming is carried on. If for no other reason, the disease entero-hepatitis (blackhead) would make turkey farming too hazardous.

Turkey eggs should be hatched by turkey hens where practicable, but they may be hatched by other hens. Very little success is likely to be obtained with hatching turkey eggs in incubators; probably not more than 25 to 30 per cent. will be found to hatch, although if set under hens for the first half of the period better results are obtained from the incubators.

Turkey hens will be found to set best when they make their own nests; sometimes, however, it is necessary to put shelter over them with a few bushes in front, to make the nest look as natural as possible. Feed and water should, of course, be placed near the nest, so that the hen can help herself. Grain, either maize or wheat, or both may be used.

At hatching time, if the turkey chickens are not hatching all together, they will be better taken away from the hen as they become dry, so that the hen will sit quietly and hatch the balance. When the chickens are taken away they should be put into a basket or box lined with flannel, or some woollen material, and kept warm until the hatch is complete, when they should be given back to the hen; this practice prevents a lot of casualties during hatching time.

The turkey hen with a brood should be confined to a small enclosure for three weeks to prevent her roaming too far and wearying the chickens.

There is no material difference between feeding turkey chickens and other chickens. They should not be given any food for the first thirty-six hours. For the first two days there is probably no better or safer feed to give them than rolled oats or very coarse oatmeal. Some use hard-boiled eggs rubbed up with breadcrumbs, but this entails great care on the part of the attendant to see that it is all eaten up and none left about after each feed, or bowel troubles will result.

After this, the principal feed may consist of pollard and bran mash mixed to a crumbly consistency. To mix this mash properly, proceed by pouring heated milk over the bran, using about one-third bran to two-thirds pollard, and varying the pollard to more or less according to whether it is fine or coarse; add about 4 oz. of common salt to the bushel of dry matter. This should be dissolved in the milk or water with which the feed is mixed.

This feeding should be supplemented by finely-crushed grain, such as wheat or maize, for the evening feed, or a very little may be given during the day, but very young chickens should not be fed on whole grain.

Finely-chaffed lucerne, barley, rape, or other succulent green feed should be given where possible. The chickens should be fed in this way more or less for the first five or six weeks, when the number of feeds may be gradually reduced and adult feeding introduced. Their feed from then on should consist principally of grain. Finely-chopped onions, leeks, &c., are a valuable addition to the ration during mid-growth.

An All-the-Year-Round Feed.

Silage, says "The New Zealand Farmer," is an all-the-year-round feed. It replaces the elements of pasture in winter, and it supplements pasture in summer. If the pasture dries up, as is too often the case, silage tides one over. If the cows are heavy milkers silage can profitably be fed with good pasture, for the variety of succulence encourages the cows to eat more.

Those who criticise silage are the people who have never fed it. The careful man who has used it would not think of trying to dairy without it.

Sheep on the Wheat Farm.

While the utility of sheep on the wheat farm is gradually becoming more generally recognised, many farmers are unfortunately content to use almost any breed of ram, and in many cases the crossbred has become a nondescript animal. It should always be remembered that a poor type of lamb costs as much to keep and as much to market as a high-class one, while the difference in price will amount to many shillings. Similarly, a poor type of ewe costs as much to keep as a good one, but will breed only a poor lamb and give half the weight of poor-quality fleece.

It may cost a little more to buy a good line of ewes or a few good rams, but the extra outlay is amply justified by the return in wool and progeny.

The ewes should not be kept after their mouths begin to break. Old ewes certainly make good mothers, but they give a poor fleece of low weight, and, furthermore, do not thrive in dry times, and they generally die early in drought periods. When they are becoming aged the first opportunity should be taken to fatten and sell them.

Success in lamb raising depends very largely upon successful mating. In some sases this may be difficult to secure, but as a rule it should be arranged to commence towards the middle of April, about which time good green feed should be available. The ewes should be in good condition, but not too fat. It assists if they can be put on some good green feed about a fortnight in advance.

Sheep are very fastidious in regard to water, and should always be provided with a good fresh supply. If the water is dirty they will only drink it with reluctance, and as ample water, particularly when they are on dry feed, is essential, they should drink abundantly. It is, therefore, an advantage to pump water from dams or tanks, and to keep the drinking troughs scrupulously clean.

Bee-Keeping in Dry Times.

The problem for young beekeepers during periods of drought is not so much how to get honey as how to get pollen, and certainly under the adverse conditions often experienced in many inland districts the lack of pollen causes very heavy losses. A suitable substitute for honey has been found in sugar syrup, but trouble came from feeding nitrogenous food, such as rye-meal, pea-meal, cocoa, &c., as a substitute for pollen. Such substitutes are valuable for a short period, but cannot be relied upon if the drought extends through the summer and autumn. The autumn is a period when young vigorous bees are necessary in the hive to carry the colony over the winter.

To minimise losses in bees during extreme conditions, three methods have been used with sufficient success to warrant mention.

1. During the first period of drought in summer pollen substitutes should be tried; small quantities of paste made of rye-meal or pea-meal, mixed with honey and fed inside the hive, should be given. Some apiarists prefer to feed the meal from shallow vessels placed about the apiary without mixing. Cocoa has lately come under notice, and beneficial results have been reported by a number of apiarists.

2. If the drought conditions extend into the autumn, it will become a matter of preserving enough bees of sufficient stamina to carry the colonies over the winter, and to give a chance of recovery in the spring. If during progressive times the apiarist reserves a good number of combs which have pollen sealed under honey, then these can be distributed among the colonies, thereby giving a chance of a fair number of vigorous bees being raised, but pollen not sealed under honey deteriorates in value as a food.

3. The commercial apiarist should, if it is at all possible, take note of the flora, and if there is no promise of bloom, and it appears possible that the drought will continue, inquiries should be made with a view of finding a locality showing brighter prospects. The temporary removal of bees (usually towards the coastal districts) is the surest method available of minimising losses. Even late in the autumn, after all local prospect has vanished, a fair recovery can often be made in this way.

Not More Cows, but Better.

Twenty cents out of every dollar that the average American family spends in food goes for dairy products, states Dr. C. W. Larsen, United States Bureau of Dairying. From the standpoint of the amount of nourishment obtained per dollar spent, dairy products are the cheapest food. But human population is increasing at a much faster rate than cow population. At the same time, per capita consumption of milk is growing as people learn more of the health-giving qualities of dairy products. What is needed most, however, is not more cows, but better.

Putting on the Brake.

"The land policy of the United States should be reconstructed in such a way as to check undue expansion," declares the United States Department of Agriculture, in a bulletin outlining what the Department says the new policy should be, which appears to be summed up in the warning caption, "Go slow in farm area expansion." It is recommended that there be a classification of privately-owned as well as the public lands, and "a systematic and co-ordinated plan of action based on it, not to directly repress individual initiative, but to educate it by research work."

Co-operative Marketing in the United States.

The following extracts from the Annual Report to Congress recently presented by the Secretary of Agriculture in the United States Government are interesting:—

"The most distinct and significant movement in American agriculture in this decade is the almost universal trend toward co-operation in the marketing and distribution of farm products. It is in no sense a regional or sectional movement, for it exists in all sections and is participated in to some extent by producers of practically all kinds of farm products.

"There has been some co-operation by farmers in the United States for many years, but within the last two decades, and particularly during the last decade, the movement has assumed proportions which indicate that it is a response to a fundamental and universal need of present-day American agriculture. It is highly significant from all points of view that the best minds in agriculture, without regard to region or commodity, are unanimous in the opinion that group action in marketing must be added to individual efficiency in production if the high standards of American farm life are to be preserved and agriculture is to maintain its proper place in our national life.

"Although co-operative marketing is a farmers' movement, it is not in any proper sense a selfish class movement and holds no menace either to consumers or other business interests. Agricultural production is essential to national welfare, and the only guarantee of an adequate and dependable supply of agricultural products is a prosperous and contented agricultural population. It is obvious to any thoughtful mind that this happy result cannot be obtained by agriculture unless it avails itself of the efficiencies and economies of organisation and specialisation which characterise other industries in this day. Consideration alike of intelligent self-interest and public welfare must prompt other classes to support wise and intelligent efforts of farmers to place their important industry upon a basis of stability and prosperity.

"To place our agricultural production on a stable and profitable basis we must recognise the inseparable relation between production and marketing. The working out of a more efficient marketing system must go hand in hand with an intelligent adjustment of production to market demand in a more orderly manner so as to avoid periods of over-production with great loss and periods of under-production with prices unsatisfactory to the consuming public. That agricultural production may more readily become responsive to the market demands, the farmers will have to organise for marketing through the development of sound farmer-owned and controlled co-operative associations.

"I view co-operation in agriculture as a business agency serving the producers both as an intelligent guide in their production programme and an effective instrument for merchandising farm products. Instead of thinking of co-operation among farmers as a producing proposition or as a selling proposition, we need to think of co-operation as a business form or organisation that penetrates our whole agricultural industry. By this I mean co-operation, in an educational way, must reach back to production practices and forward through efficient business organisation to marketing practices. It is from this concept that I look upon co-operation as a 'business form or organisation' adapted to the farming industry."

Denmark Fears Competition in Foodstuffs.

Following the example of some of the New Zealand dairies, Danish butter producers propose to pack their produce in half-pound and pound packets, and an expert committee has been appointed to examine the best methods by which this may be done to meet competition in the British markets. This step is a direct outcome of the progress which colonial butter is making in public favour in the United Kingdom.

The increase in the German tariff has greatly interfered with Denmark's butter trade with Germany; and if, as is expected, the American duty on imported butter is raised from 8 to 12 cents per lb., the effect will probably be to divert to Great Britain supplies of New Zealand and Australian butter which, in the ordinary course, would be shipped to the United States. This development is feared in Denmark as likely to have a further detrimental influence upon the demand for Danish butter in this country.—"Times Trade Supplement."

Keeping Fowl Houses Clean.

The best spray for keeping or getting poultry houses clear of vermin is kerosene emulsion used as frequently as may be necessary.

To make the emulsion, take 8 oz. of soft soap and dissolve it in 1 gallon of boiling water; take the mixture off the fire and add slowly 1 gallon of kerosene, stirring all the time. This mixture should be agitated briskly until the oil and the soapy water are thoroughly emulsified. These 2 gallons are then designated the "stock." Add to this 10 gallons of soft water. Hard water will not do, nor should lime or any caustic substance come in contact with it, or the result will be that the oil will separate from the soapy water, and the emulsion will be spoiled.

If it be desired to make the spray also a disinfectant, add 1 tablespoonful of miscible carbolic acid to each gallon of emulsion. The whole should be kept well stirred, especially when adding water.

A small force pump suitable for this work, which can be stood in a kerosene tin and held down by means of a footrest that is provided, is obtainable, complete, with a short length of hose and nozzle at about 32s. 6d. in Sydney.

Should the vermin be confined to the roosts, these might be washed over with a brush in place of spraying.

The method described above is the only way in which it is possible to make the emulsion, and unless it is followed exactly the product will be useless. If the oil and water are not thoroughly emulsified (mixed) the oil will float on top of the soapy water and the mixture will be absolutely ineffective.

How to Detect Non-Laying Hens.

It is possible for the experienced eye to run over a flock of hens and very closely to approximate the daily number of eggs being laid, and to pick out the hens that are not actually laying from those that are—and this only by the condition of the hens! Many of those that are not laying can be recognised at once by the shrunken condition of the comb, wattles, face, and eyes. There will be others in which these features are less pronounced, and which are in a stage of going off or coming on—at this time of the year mostly the former.

But one can get a still closer estimate by handling the birds. The guide in this case is the pelvic bones. If the pelvis is closed to, say, 1 inch or less, and the bones have become rigid and hard instead of wide apart and pliable, it is a sure indication that the hen has ceased to lay or to develop oscytes, in which case she will be off laying for some considerable time. If, on the other hand, the bones are neither wide or closed, but are a medium width apart, it is an indication that the state of laying, while it might be suspended, is not yet a decided factor. If the pelvic bones are sufficiently wide to admit of the free passage of an egg, and they are supple so that then can become relaxed, it is a sign that the hen is in laying condition.

These two bones are situated one on either side of the vent, slightly above it, and, as a rule, they are only just covered by skin. There are finer points of judgment which can only come as a matter of experience. The idea that the measure of a hen's capacity as a layer can be determined by the distance between the pelvic bones should not be entertained seriously, but expansion and contraction are a fairly reliable guide as to whether a bird is laying or not laying. A little practice should make anyone with ordinary intelligence sufficiently proficient to cull the actual non-layers from the layers.—"Agricultural and Pastoral Notes," Department of Agriculture, New South Wales.

Cover Cropping—Some Important Rules.

The upkeep or humus in orchard soils is of great importance, but the ploughing in of cover crops must be done with great caution or more harm than good may be occasioned.

In our inland parts, where the rainfall is only just sufficient for the healthy growth of the tree and production of fruit, it is only during an abnormally wet year that a cover crop can be grown. As it is impossible to forecast with certainty how the season is going to continue, some risk is involved even in a wet year. In districts of much higher rainfalls the risk is less, of course, as one has only to fear the exception when the rainfall is short. Where water is available for irrigation this danger is eliminated, though it must not be forgotten that the cover crop (whether it be a sown crop or a crop of weeds) is competing with the trees, and extra water must be allowed accordingly.

Cover crops should be sown early in order to obtain as much growth as possible before ploughing time in the winter. A leguminous crop should be sown if possible. Straw crops should be avoided among trees.

Make sure of having the cover crop all ploughed under by the middle of July, regardless of whether it has reached its full growth or not. If it is allowed to remain longer and the season turns dry, the trees and coming crop may suffer from loss of moisture. Even where this risk can be eliminated by applying water artificially it is still necessary to plough under before the end of winter, in order to give time for the cover crop to rot and render available to the trees in the spring the plant-foods it contains, and which it has largely absorbed from the soil.

If a dry autumn occurs after an early sown crop has made a good start, and the citrus trees commence to show signs of distress, the cover crop should be sacrificed if water cannot be applied. Whether green manuring can be practised in an orchard or not, every opportunity should be made use of to apply any bulk organic matter to the soil which will rot down and form humus.—A. and P. Notes, Department of Agriculture, New South Wales.

British Trade in Frozen Eggs—An Interesting Suggestion.

In a report received by the Federal Department of Markets and Migration, Melbourne, the Commercial Officer at Australia House, London, states that the intention of the Imperial Government to prohibit the importation of eggs preserved with boracic acid will undoubtedly create a big demand for liquid yolks preserved by freezing, and, in his opinion, the opportunity appears to be an excellent one for the shipment to England of eggs which do not meet the standard required for eggs in shell. It is understood that it is the practice to separate the yolk from the white, and to freeze the yolk, the albumen being dried and shipped separately.

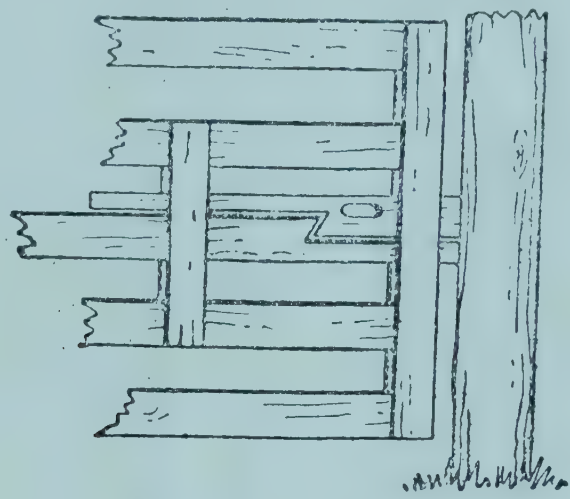
A London firm which is said to be largely interested in the egg trade stated that when the regulations referred to become operative, the equivalent of the amount of preserved liquid yolk and dried albumen now imported from China will have to reach Britain either frozen or in shell. Of these two forms, this firm states, the frozen egg has many advantages for commercial use over those in shell, and as it is a commercial article that has to be replaced, it is, in the opinion of this firm, safe to assume that the demand in Great Britain for frozen eggs (not in shell) will increase enormously, with an obvious advance in prices. This firm gave the following reasons why previous effort by Australia to establish this trade failed:—

1. Lack of care in excluding musty or tainted eggs.
2. Impurities such as straw and portions of shell in the eggs.
3. Competition with China, which produced a highly superior article at competitive prices.

This firm (the name of which can be obtained on application to the Department of Markets and Migration), states that the present time is an opportune one for the establishment of this trade, and gives as one of their reasons that China, which now exercises practically a monopoly of the trade, is constantly in a state of revolution, with the consequent disorganisation of supplies. The firm offers its services to any Australian firm or association likely to be interested in this trade.

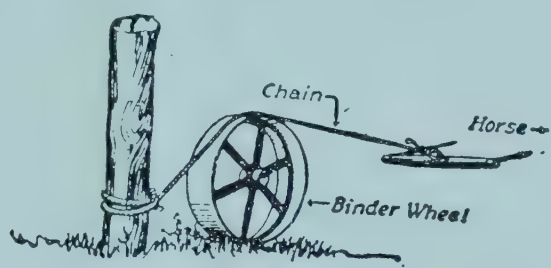
SURE AND SIMPLE.

Here is a gate latch that is easy to make and sure in its action. The stock cannot open this, though the plan of it is so simple that no explanation other than the sketch is needed to show how it is made and operated.



PULLING STUBBORN POSTS.

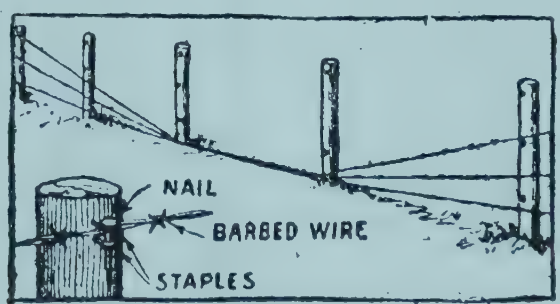
Even though an old fence post be set in the ground firm and fast, it is a simple matter to pull the post if a strong implement wheel or wheel from a discarded oil engine, a stout chain, and a horse are available. All that is necessary is first to fasten the chain securely around the post that has outlived its usefulness at a point about four inches above the ground.



The wheel is set up so that its tire is close to the post. The chain is strung circumferentially over the wheel and its free end fastened to a swingletree. When the horse is hitched to the swingletree and exerts his strength in a forward pull, the chain rolls over the tire of the wheel and the post comes out of the ground as easily as the dentist extracts a baby tooth.

FENCE OPENING WITHOUT CUTTING WIRES.

Farmers often loosen the wires of a fence from a few posts and weigh them down to make a temporary opening which can easily be made into a permanent gate that the casual observer would hardly notice. Instead of fastening the wire



to the posts in the usual manner, staples are driven horizontally on each side of the wire. The staples are set into the post far enough to leave an eye through which a nail is inserted to hold the wire to the post. The wires are kept down by hooking them over nails driven into the post near the bottom.

Orchard Notes for July.

THE COASTAL DISTRICTS.

The marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventative. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in acordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated, but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description or the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit. This commanded the highest price realised for mandarins last season.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former, and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing, well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

July is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before spring growth starts.

In pruning, follow the advice given in the June number; and if you are not thoroughly conversant with the work, get the advice of one or other of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left, there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out, it is undersized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two-years' growth or more; apricots and Japanese plums on new growth, and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime-sulphur.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start grawth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm and Garden Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine, and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early flowering period—*i.e.*, when about one-third of the plants in the crop are in flower.

KITCHEN GARDEN.—Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, holy-hocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c., Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. K. CHAPMAN.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1926.	May.		June.		Moonrise. May.	Moonrise. June.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6·20	5·18	6 38	5·2	p.m. 7·58	p.m. 9·50
2	6·21	5 17	6·38	5·2	8 52	10 55
3	6 21	5·17	6 38	5·1	9·50	11·57
4	6 22	5 16	6 39	5 1	10 53	nil
5	6 22	5·16	6·39	5·1	11 58	a.m. 1·0
6	6 23	5 15	6·39	5·1	nil	2·1
7	6·23	5·15	6·40	5 1	a.m. 1·2	3·2
8	6·24	5 14	6·40	5·1	2 5	4 3
9	6 24	5·13	6 41	5·1	3·8	5·2
10	6 25	5·12	6·41	5·1	4 11	6·1
11	6 25	5·11	6·41	5·1	5·12	6·58
12	6 26	5·11	6·42	5·1	6 12	7·54
13	6·26	5 10	6·42	5·1	7·13	8·45
14	6 27	5 10	6 43	5·1	8·14	9 32
15	6 27	5·9	6 43	5·1	9·11	10·14
16	6·28	5 9	6·43	5 1	10 4	10·53
17	6 29	5·8	6·44	5·1	10·54	11·28
18	6 30	5·7	6 44	5·2	11 39	p.m. 12·2
19	6 31	5·6	6·44	5·2	p.m. 12·18	12·33
20	6·32	5 6	6·44	5·2	12·54	1·6
21	6·32	5 5	6·44	5 2	1·30	1·39
22	6 33	5·5	6·44	5 3	2·2	2·16
23	6·33	5·5	6·44	5 3	2·36	2·56
24	6·34	5·4	6·45	5·3	3·7	3·41
25	6·34	5 4	6·45	5·3	3·43	4·30
26	6 35	5·3	6·45	5·4	4·21	5·29
27	6·35	5 3	6 45	5·4	5·4	6·31
28	6 36	5·3	6·45	5·4	6·0	7·38
29	6·36	5·2	6·45	5·5	6·44	8·45
30	6·37	5·2	6·45	5·5	7·42	9·50
31	6·38	5·2	...	...	8·46	...

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

5 May	☾	Last Quarter	1 13 p.m.
12 ,,	●	New Moon	8 55 a.m.
20 ,,	☽	First Quarter	3 48 a.m.
27 ,,	○	Full Moon	9 49 p.m.

Perigee, 7th May, at 3 42 p.m.
Apogee, 20th May, at 3 48 a.m.

An occultation of the star Delta Capricorni will occur at an early hour on the 10th May when the Moon will be not far from the eastern horizon in a crescent shape tilted up, with the horns somewhat toward the right. The star will disappear behind the bright edge of the Moon about 3·20 a.m., and reappear about 50 minutes later on the dark edge of the Moon. A pair of binoculars or small telescope should make this an interesting spectacle.

The big planet Uranus will appear as a tiny star just below the much more brilliant Venus before sunrise on the 5th; binoculars will be required to see Uranus. The ringed planet Saturn will be in opposition to the Sun on the 14th and, rising about sunset, will be a beautiful object for observation in a telescope during the early hours of the evening.

About 9 p.m. on the 26th a conjunction of the planets Saturn with the Moon will occur when they are high up in the N.N.E. in the direction of Libra with the Scorpion on the right.

3 June	☾	Last Quarter	6 9 p.m.
10 ,,	●	New Moon	8 8 p.m.
18 ,,	☽	First Quarter	9 14 p.m.
26 ,,	○	Full Moon	7 13 a.m.

Perigee, 1st June, at 4 24 p.m.
Apogee, 16th June, at 10 18 p.m.
Perigee, 28th June, at 7 48 p.m.

About one hour before sunrise on the 2nd the star Gamma Capricorni will disappear behind the eastern edge of the Moon; it will not reappear until about the time of sunrise when it will be less observable. Mercury will be invisible in the early part of June being in superior conjunction with the Sun on the 5th, but towards the end of the month it will be visible somewhat indistinctly low down in the west about an hour after sunset.

On the 22nd at 2·30 p.m. the Sun will arrive at its greatest northern declination and the solstice will occur; the sun having reached its greatest northern declination, will pause and turn to come southward again. Saturn will be in conjunction with the Moon on the 22nd at 3 a.m., when Saturn will appear the uppermost at a distance of about four times the diameter of the Moon to the south. On the night of the 26th about 12·15 a.m., Omicron Sagittarii will disappear behind the lower eastern edge of the Moon and will reappear on the lower western edge about 12·30 a.m. Jupiter will be in conjunction with the Moon on the 29th at 9·39 p.m., when the planet will be about five times the diameter of the Moon to the left of it.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.